ELECTRICAL REVIEW

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Testing Apparatus

NEW SERVICE FOR THE SMALLER MANUFACTURER

FROM time to time inquiries come to us, and doubtless to other centres of information, from manufacturers seeking to have apparatus tested. Often they have not themselves the requisite facilities for determining the quality of the device, although more usually their wish is to obtain an unbiased opinion of its fitness for its purpose.

Scope of Existing Services

These inquirers have invariably to be disappointed for there has not for many years now been any means of satisfying their requirement. They cannot properly be referred to the E.D.A. Testing House, which mainly concerns itself with domestic appliances, and endeavours to persuade manufacturers to modify design and/or improve insulation for greater electrical safety in household use.

Neither does the National Physical Laboratory seem to fit the case. The primary purposes for which these laboratories were founded—which they continue so successfully to fulfil—were to undertake research, to establish and maintain precise standards of measurement, and to test instruments and materials. But the N.P.L. does additionally undertake investigations for industrial firms and other "outside" bodies, which are paid for according to established scales of fees.

The apparent reluctance to make use of this facility is perhaps not so much due to the time and expense involved as to the fact that the need we have in mind is not to "solve problems" or for "regular testing" under prescribed conditions. The requirement, on the contrary, is for reasonably quick determination of the general merit of some piece of apparatus, or component part thereof, in the uncertainties of ordinary commercial service and normal industrial use.

It is, in other words, believed that the small and medium manufacturer will welcome some means of enabling him to obtain an impartial assessment of the probability that his product will perform its duties, or not, in the way forecast by its designer.

E.R.A. Initiative

A step towards remedying this deficiency has now been taken by the Electrical Research Association, which has more than once in its annual reports drawn attention to the lack of sufficient testing facilities in the electrical industry. The E.R.A. is of course not in a position to carry out testing work of a non-research character, except in special cases. Its

functions are necessarily limited, somewhat similarly to those of the N.P.L., direct assistance being restricted by policy.

But the Association now aims at an indirect contribution—not only to E.R.A. member firms—by organizing the passing on of work of this kind to certain technical colleges and universities, which will carry out the tests at appropriate charges to be mutually agreed. The E.R.A. is prepared to loan special equipment for this purpose and to give technical advice; but the educational institutions co-operating in this scheme will not do routine testing, although willing to carry out type tests or to test prototypes, especially those from which their staffs might gain information likely to be useful for teaching and their own research activities. Although this new service cannot satisfy more than a part of the need, it is welcomed as being capable of becoming very valuable.

CAMBRIDGE PROFESSORSHIP

The endowment in perpetuity by the electrical manufacturing industry of the Chair of Electrical Engineering at Cambridge University, initiated by the I.E.E. in 1944, is another example of the recognition by the industry of the importance to its future of producing men of high educational attainments. The sum of £71,000 subscribed by about half the membership of the British Electrical and Allied Manufacturers' Association exceeded substantially the amount aimed at (£65,000) and we are told that there is more to come. In these times of rising costs it is as well to have something to spare.

STAND-BY SUPPLIES

Sir Lynden Macassey, chairman of the British Internal Combustion Engine Manufacturers' Association, in a letter to *The Times* expresses dissatisfaction with the suspension until 1956 by the B.E.A. of its "restrictions" on the operation of their own plant by industrialists. He considers that the period is insufficient to encourage the installation of this plant which is very necessary now. He asks whether there is not a case for "some reasonable modification of the monopoly of supply under present national and international conditions." Sir Lynden still implies that the B.E.A. has power to forbid the installation of private plant. Its "restrictions" (actually those of its predecessors) merely took the form of refusal to provide a stand-by supply except on what it considered to be economic terms.

THE OVER FORTY-FIVES

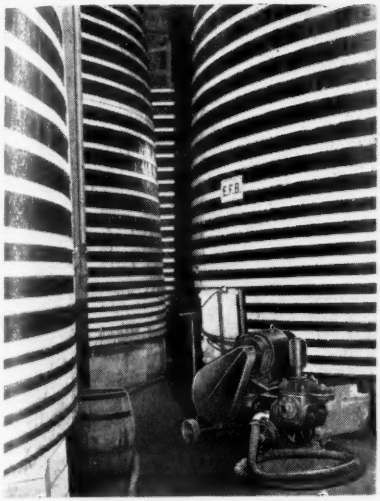
The yearly review of the activities of the Professional Engineers' Appointments Bureau, to which there is further reference on another page, shows that the real shortages during the last twelve months have been of men with outstanding academic qualifications and of engineers with highly specialized qualifications. It is believed that more vacancies might be filled if the upper age limit specified by employers could be raised, for the majority of the unemployed on the register are men aged over forty-five years. The housing shortage continues to limit the number of posts for which men can be nominated.

ELECTRICIANS' RISE

Wages of electricians in the contracting industry are being increased by 10 per cent in London and over 8 per cent in the rest of the country. This substantial rise has been conceded by the employers on three grounds: The wage levels and earnings in industry generally; the increased cost of living; and the desire to award "fair and equitable rates in return for the maximum productive effort." There have been previous attempts to relate pay with output in the industry but the results have not been all that might have been expected. This latest substantial addition will lead to much higher installation costs unless the "maximum productive effort" is put forth.

PORTABLE TOOLS

Minute as is the proportion borne by electrical accidents to the total in industry (less than 0·5 per cent) their number is reducible. Mr. A. Midgley in his recent lecture to the A.S.E.E. showed where the chief weakness lies. Portable apparatus and flexible cables are the source of 28·8 per cent of all reportable electrical accidents and 35·7 per cent of those proving fatal. Nevertheless, their use is necessary, often in dangerous conditions and in temporary installations. Transformation to 110 V (64 V to earth) for portable tools virtually eliminates shock risk. A lower voltage might introduce another hazard in that, to avoid cumbrous connections, the transformer with its 240 V terminals would be brought too near the operator.



Considerable pumping to and from the various vats is effected by portable motor driven units

Cider Making

Complete New Milling and Extraction Plant

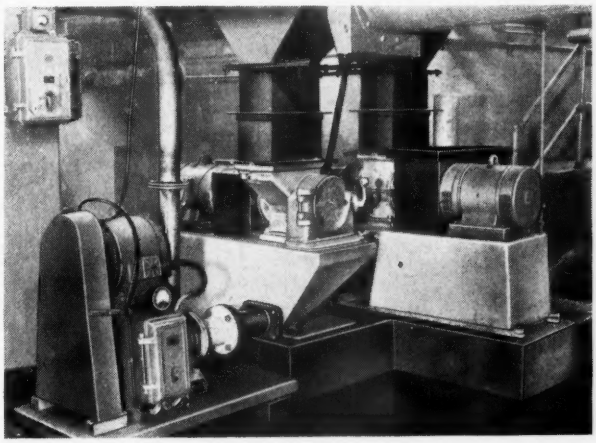
ELECTRICAL applications at the Hereford cider works of H. P. Bulmer & Co., Ltd., have been marked by continuous development coincident with modernization of production over very many years, and the work still goes on. Within this pattern there are, however, certain more clearly defined stages representing such major schemes as new sections of the works or plant. For instance, on a site (Moorfields) near but separate from the main works a new mill was started up in August last and has therefore just finished its first working season.

This mill is the third comprehensive installation for the extraction of juice from the apples and is obviously the most modern in all respects.

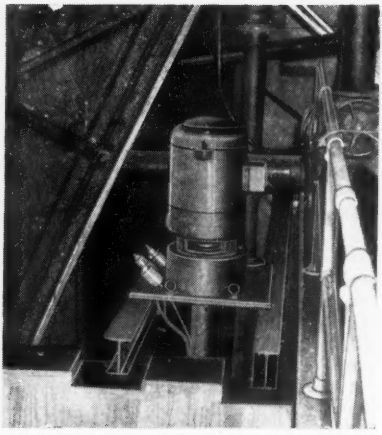
It is therefore proposed to do no more than refer to the two older mills at the main works, and in our account of the electrical applications to production we shall generally follow the latest processes and not attempt to describe all the plant.

During the extraction season, i.e., about August to December, special cider apples (bitter-sweets) are received from the farmers over a wide area in that part of the country, in the farmers' or contractors' own transport. Bulmers have not much orchard area of their own, but they grow and sell trees to the farmers and they conduct much apple growing research for the benefit of the farmers.

The fruit comes to the works sacked in lorries which are weighed in full and out empty by twin Avery 30-ton weighbridges which are equipped with automatic electrically operated ticket printers. The apples are unloaded into concrete pits from which the fruit is water borne into the mill.



Each of the grinding mills handles 10 tons of fruit an hour and the monopump (left) passes the pulp up to the hydraulic presses



From the receiving well in the mill the water is lifted by a Pulsometer pump and the apples by a bucket elevator

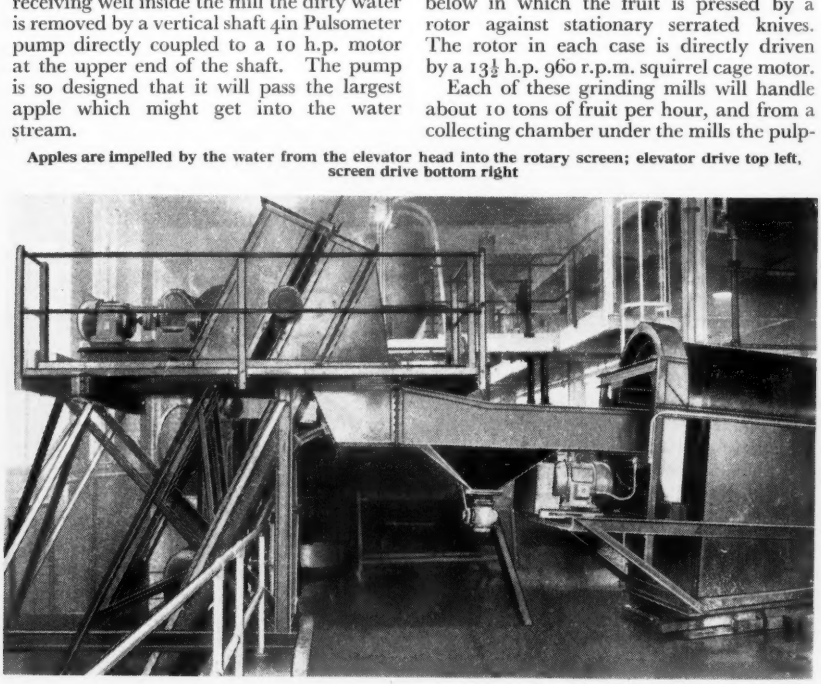
In this process, of course, the apples receive a preliminary cleansing and from the receiving well inside the mill the dirty water is removed by a vertical shaft 4in Pulsometer pump directly coupled to a 10 h.p. motor at the upper end of the shaft. The pump is so designed that it will pass the largest apple which might get into the water stream.

On a floor several feet above the well is an inclined rotary screen to the head of which the apples are fed from the well by an inclined bucket elevator, while at the same time the water lifted from the well by the Pulsometer pump is also fed into the screen head, with the result that the apples are impelled into the screen by the water. The fruit is given a final wash in the screen with clean water. From the screen the water flows back into the canal system for recirculation.

The bucket elevator is driven by a 7½ h.p. 960 r.p.m. motor and the transmission is through a gear box which provides an overall speed reduction ratio of 6 to 1. This drive is mounted on a platform near the head of the elevator, while on an extension of the screen structure near the raised end is the 7½ h.p. drive for the screen which has unusual transmission in that while the motor itself is a two-speed unit the transmission gear box provides 13 different speeds on its own account. From the rotary screen the apples are hopper fed into grinding mills on the floor below in which the fruit is pressed by a rotor against stationary serrated knives. The rotor in each case is directly driven by a 13½ h.p. 960 r.p.m. squirrel cage motor.

Each of these grinding mills will handle about 10 tons of fruit per hour, and from a collecting chamber under the mills the pulp-

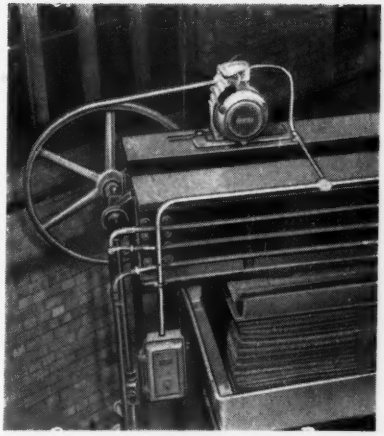
Apples are impelled by the water from the elevator head into the rotary screen; elevator drive top left, screen drive bottom right



like ground material is pumped up to receiving hoppers which serve the presses on the floor above. For this pulp pumping operation a 3in bore monopump is employed, and this is driven by a 5 h.p. motor with a 3 to 1 ratio reducing V-belt transmission. The pump exerts a pressure of 50 lb/sq in.

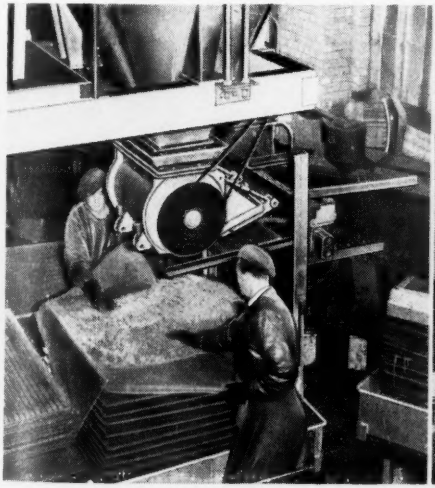
The hydraulic juice extraction presses are three-station equipments; one station is for loading and unloading, one station is a preliminary press and the final station provides high pressure treatment at 6,000 lb/sq in. The pressure medium is oil and the pressure is created by a tiny reciprocating pump on the upright of the high pressure station structure, while the pump is driven by a 2½ h.p. motor surmounting the same structure with about 3 to 1 V-belt transmission. From the receiving hopper centrally disposed above the loading station the pulp is fed downwards by a rotation feeder driven by a very small geared motor unit having a final speed of 12 r.p.m. .

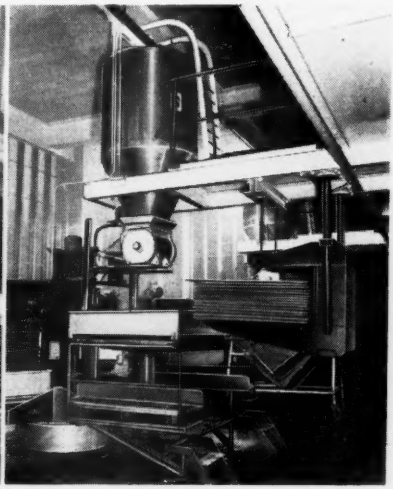
At the loading or "cheese" building station of the hydraulic press each prescribed quantity of pulp fed down from the hopper is strewn out by hand to form a "hair." The hair consists of this pulp folded up in a special fabric square all within a suitably sized frame. The hairs are built up progressively one upon the other, with wood grids between each pair, until the required number of hairs for the cheese is obtained, when the whole is passed round to the low pressure station. The cheeses are moved around simultaneously from one station to another by hand on a rotary assembly about a central vertical shaft. From the low pressure station the cheeses are moved round



Oil pressure for each hydraulic press is created by a small reciprocating pump on the upright of the h.p. station driven by a motor surmounting the structure

Each prescribed quantity of pulp fed down from the press feeding hopper is strewn out to form a "hair." Right: Each hydraulic press has three stations—cheese building, high pressure and low pressure





similarly to the high pressure station. After the juice is extracted the cheeses come round again to the cheese building station for dismantling before new cheeses are built up. At the cheese building station the containing ram is raised and lowered hydraulically, so that the operating level is the same at all stages of the process.

As the hairs are dismantled the sheets of compressed solid matter (pomace) are passed on to a swing hammer distintegrator which is self-contained with its feeder conveyor. The broken material falls into a screw conveyor which passes it on to a drying plant to be prepared for the production of pectin. The disintegrator has a 12 h.p. drive direct to the swing hammer shaft, with reducing V-belt transmission to the auxiliaries.

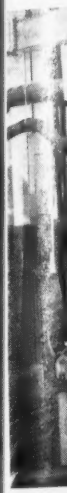
Generally speaking all the motors in this new mill are G.E.C. machines, and within the range of 5 h.p. to 15 h.p. starters with built-in line switches are employed; in most cases the starters are equipped with ammeters. For motors below 5 h.p. Allen West contactor starters are used. A feature of the distribution equipment for this new mill is a Bill switchboard which is " split " so as to provide for the double tariff conditions under which the works is at present supplied. But there is provision in the design for the two sections of the board to be joined up later when a single tariff becomes available. The board also allows for considerable future extensions, including the trebling of the present mill and the installation of a large pomace drying plant. While there is some juice storage capacity at this new (Moorfields) mill the bulk of the juice is pumped over to the main works where there is a storage capacity for over 6 million gallons.

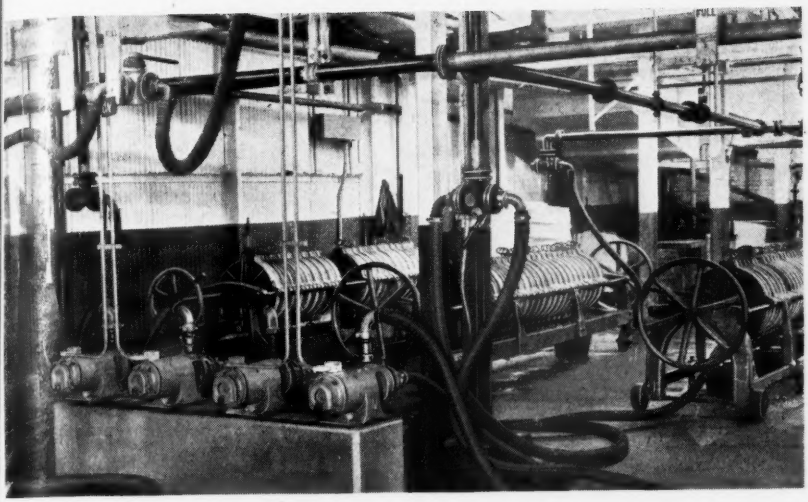
Juice from all the mills is pumped into receiving vats in which it is measured, and then it is racked into fermenting vats where fermentation takes place under the very close supervision of the laboratory. After fermentation there is considerable conveyance of the cider to and from blending, mixing and storage vats, and the pumping operations thus involved constitute a considerable part of the factory load. Most of this work is done by portable pumping units with capacities from 2,000 to 5,000 g.p.h. Each unit is complete with its driving motor, all of which are served by the works 230 V d.c. system. This is partly on account of the greater safety attributed to low voltage d.c. in comparatively wet cellars. But before final storage in the vats the cider is filtered through horizontal multiple disc pressure filters in connection with which considerable pressure pumping is required. Stationary pumps, directly motor driven, are used in this case, however, and four lines of filters, with one as a spare, work in conjunction with their motors on a working cycle, but interchangeability between the pumps, filters and pipe lines is afforded by flexible hose pipes. Cleansing of the used vats is, of course, most important, but perhaps more so is the necessity first to remove the CO_2. Wolf portable blowers reversed in operation have been found particularly suitable for removing this gas from the vats.

As required the cider from the storage vats is passed on to casking and bottle filling departments where such operations as bottle washing, bottle filling and stoppering employ many small motors which have an adverse effect on the installation power factor. But steps have been taken to remedy this state of affairs by the installation of a 65 h.p. auto-synchronous motor with a 0·85 leading p.f. for driving a Hall ammonia compressor which is now used as the essential part of an installation for cooling the cider before the carbonating process.

The production of champagne cider involves, we are told, processing identical with that employed for the production of champagne from grape wine in France. It is carried out in the extensive cellars at the Bulmer works and involves a second fermentation in the bottle of the already bottled cider. After lengthy storage the bottle necks (downwards) are passed through a brine tank, with the result that a plug of ice is formed at the bottom, thus sealing the sediment against the cork. In the upright position the cork is then withdrawn from the bottle and the gas in the cider shoots the ice and sediment out, leaving the clear product. After adding some syrup, recorking, fixing the muselet over the cork, labelling, etc., the champagne cider is ready for despatch.

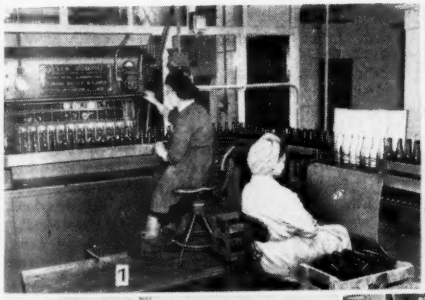
A by-product of cider making is pectin for jam manufacturers. The pectin is extracted from the pomace mainly by boiling, and the major electrical application, apart from the conveyance of the liquid by pumping, is agitation of the mixtures in the boiling and storage vats.

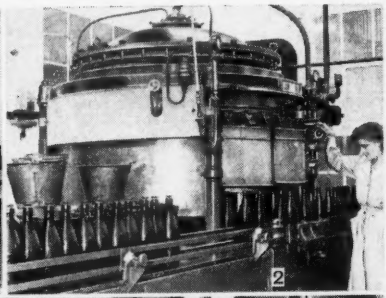


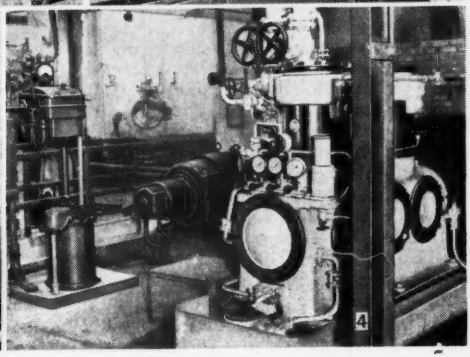


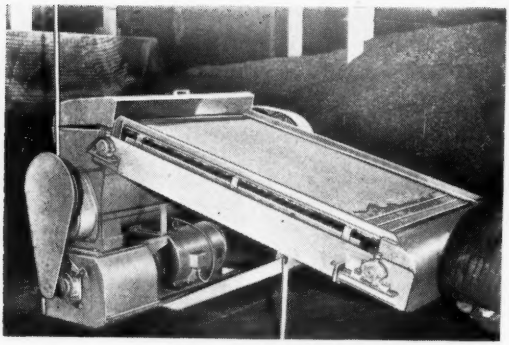
Before final storage in the vats the cider is filtered, necessitating considerable pumping

Operations such as bottle washing (1) bottle filling (2) and stoppering (3) employ many small motors which adversely affect the installation power factor. This is remedied by a large autosynchronous motor driving an ammonia compressor (4) for cooling cider before carbonating









After extraction the compressed pomace is passed to a swing hammer disintegrator

One of the several departments ancillary to the works is the laundry for dealing with the farmers' sacks. These are first dealt with in machines with stationary outer and revolving inner drums, and the drums are reversed by fast and loose pulleys on a group drive. The bulk of the water is removed from the sacks by Broadbent centrifuges which are preset for their times of operation. The incorporated vertical motors are directly coupled to the inner or revolving containers of the centrifuges. The final major operation in the laundry is drying the sacks in a chamber about 20ft long, 12ft wide and 8ft high. There are two motor driven endless conveyors at the top, and the sacks are hung on these at one end and are slowly moved through the container while being subjected to hot air streams created by motor driven fans.

A considerable amount of process heat is required throughout the works, largely for the boiling in the pectin department, but also for cask and bottle washing and other operations. This process heat requirement is largely responsible for some private generation at the works where there are two 150 kW Bellis & Morcom-E.C.C. steam engine alternator sets generating at 400 V, 3-phase a.c. The engines are served by three Lancashire boilers whose main duty is the provision of the process heat.

About one-third of the works load is d.c. and there are both a.c. and d.c. public supplies into the works. This d.c. supply is provided by a 150 kW Hewittic glass bulb mercury arc rectifier equipment with two bulbs on each 230 V side of the 460 V 3-wire system. There is provision, however, for the conversion to d.c. of some of the private generation supply by means of an 80 kW Electric Construction Co. glass bulb mercury rectifier fitted with one bulb on each 230 V side of the 460 V 3-wire system.

We are indebted to H. P. Bulmer & Co., Ltd., for permission to visit the works and to publish this article, and to Mr. D. MacCalman, works manager, Mr. V. Beach-Thomas, development engineer, and Mr. J. H. Barrow, works engineer, for their help in obtaining the information and photographs.

British Instruments in Paris

AT the invitation of the French government research authorities and under the auspices of the French Physical Society the British Council is organizing an exhibition of British scientific instruments to be held from 11th to 17th May at the Sorbonne in Paris, simultaneously with the annual French Physical Society Exhibition. The British exhibition, which is in the nature of a return gesture for the French Scientific Instruments Exhibition held in London in February last year, will consist of about forty exhibits, mainly working models designed to illustrate British achievement in the design of scientific research instruments. These are being lent by various industrial organizations and by university and government laboratories, and have been selected by an Advisory Committee under the chairmanship of Professor G. I. Finch, F.R.S., Imperial College, London.

The exhibition will be opened by Professor E. N. da C. Andrade, F.R.S., and a number of other leading British scientists will give lectures during its run.

Swedish Company's Progress

LAST year Allmänna Svenska Elektriska Aktiebolaget (A.S.E.A.), Sweden's largest electrical manufacturers, made a net profit of kr. 16·2 million (£1·12 million) against kr. 10·4 million in 1949. A dividend of kr. 8 per share is being paid on capital increased during the year from kr. 90 million to kr. 135 million. The board recommends a further increase of capital to kr. 202·5 million to provide funds for the extension of the company's works.

Jointing Aluminium Cable

Methods of Wiping and Soldering

By P. A. RAINE, F.R.I.C.*

POWER cables sheathed with aluminium instead of lead were first introduced to the British market on a full commercial scale in 1948.† Before then they had been an interesting curiosity and little more. To-day, scarcely three years since the original commercially produced lengths were installed, aluminium sheathed cables are accepted by the electrical industry, not merely as a substitution for lead cables, but also as a sound engineering achievement in their own right.

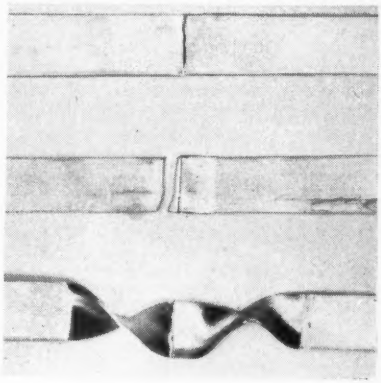
Of the many problems which confronted those concerned with the manufacture and utilization of aluminium sheathed cables, the method of jointing was prominent in view of the recognized difficulties of applying to aluminium the easy and conventional wiping process so long familiar with lead. For a time the use of mechanical unions for effecting a hermetic seal was seriously considered, until a solution was found in the discovery of a simple tinning technique for jointing the aluminium sheath to lead or copper joint shells, brass glands, etc.

Because lead-tin-alloy solder did not at first appear to be promising for use with aluminium in view of its known resistance to soldering methods in general, a mechanical joint was tried in which the belled-out cable sheath was tightly gripped between the faces of two cadmium-plated brass rings. The outer surfaces of these rings were then tinned and used as the base for a normal wiped joint. Although effective, this method was not regarded as ideal, since it involved preparation of the cable ends and the provision of special fittings which increased the cost of a joint.

Investigation was therefore concentrated upon the production of a metal which would tin the aluminium and so prepare it for the wiping process on established lines, but without the use of temperatures greatly exceeding 200 deg C, otherwise the cable insulation would be damaged. Endeavours to satisfy these requirements ranged over a wide field until in July, 1948, the British Aluminium Co., Ltd., drew attention to its patent No. 614823. That method is to clean the aluminium surface with an aqueous solution having a solvent action upon the oxide layer, wash away the solution, dry off the metal and tin the surface with a solder of high tin content, which should contain zinc to assist in "wetting" the aluminium surface; flux is not required. The tinned surface is then used as the base for a wiped joint, using an ordinary antimonial wiping solder.

Experiments showed that the method produced reasonably satisfactory joints. Elimination of fluxes was a great advantage, since fluxes for aluminium are usually potentially corrosive to the metal. They are also excellent electrolytes and it is not desirable to incur any risk of the exposed cable insulation becoming contaminated with such materials. The method still

Lap joints of aluminium strip, as made, after tensile strength and twisting tests



* Chief Chemist, Johnson & Phillips, Ltd.

† *Electrical Review*, 23rd April, 1948, and 28th Jan., 1949.

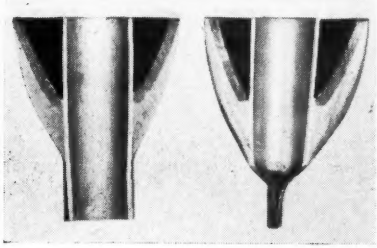
suffered from the very severe disadvantage that washing the surface of the sheath with aqueous solutions in the cleaning process would undoubtedly lead to contamination of any exposed insulation. For this reason, the patent method was not directly applicable to cable work.

Further experiments showed that if the aluminium is completely degreased with trichlorethylene, a clean metallic surface sufficiently free from oxide film to be tinned is obtainable by filing the surface of the metal. When the filed surface is heated (with a blowlamp) and subsequently rubbed with a stick of suitable tinning solder, the solder will adhere quite readily to the aluminium without any flux being required. The resulting tin coating is still not perfect and complete, for the abraded aluminium surface partially reoxidizes during the heating-up period, but the aluminium oxide film so produced is extremely thin and readily removed by mild abrasion under the surface of molten tinning metal. The first adherent tin coating is therefore vigorously wire brushed while still molten, by which means a smooth and uniform layer is obtained. Once the sheath has been so tinned, the joint is completed by application of wiping solder in stick form just as on a lead sheathed cable.

Choice of Solder

The high zinc content solders usually employed on aluminium surfaces exhibit high liquidus temperatures of 300 deg C, or more, and quite long plastic ranges. For efficient tinning a solder of short plastic range and low melting point is desirable to avoid damage to the cable insulation by overheating. Many types of solder were tried, but none was so suitable as the original 90 per cent tin and 10 per cent zinc composition recommended by the British Aluminium Co. patent. This alloy is quite a simple one, readily manufactured, of almost the theoretical eutectic composition (with a consequent low melting point) which confers stability and freedom from segregation; it becomes fully liquid at 200 deg C.

Half sections of complete wiped joint between aluminium sheath and lead joint shell before and after crushing sheath



A considerable amount of work was also done in selecting the most suitable grade of plumbing metal for application to tinned aluminium. The standard practices of different users of cables indicate conflicting opinions about the grades employed on lead cables, but the company with which I am associated used Grade " D " of B.S. 219, so consequently it was originally adopted as the standard for use on aluminium, with excellent results both on test and in service. Grade " D " solder, however, may contain up to 1·7 per cent antimony, which introduces some risk that brittle constituents may be produced in the presence of zinc.

At the same time the general properties of joints made with antimonial solders are slightly better than those with a non-antimonial type of the same tin content. Experiments showed that if antimony was to be eliminated a compensating increase in the tin content above the 30 per cent of Grade " D " was desirable to avoid risk of porosity. Finally a satisfactory grade was selected of composition 65 per cent lead and 35 per cent tin with a maximum permitted antimony content of 0·3 per cent; it has now become the accepted standard for use on aluminium sheathed cables. This solder did appear as Grade " H " in editions of B.S. 219 prior to 1949, although it is omitted from the current edition; it is hoped that in view of its new importance this grade will be re-introduced as a standard grade at the earliest possible opportunity.

An exhaustive series of tests has shown that interdiffusion between solder and aluminium provides a joint of more than adequate strength for cable work. Assessment of the properties of tinning solder was most conveniently carried out on lapped joints of known and critical dimensions between two aluminium strips, examples of which are illustrated. Samples were examined for soundness by X-rays before testing. A most remarkable feature of this investigation was the good performance under test of many joints which were known

to be incompletely filled. This feature alone gives added confidence in its use.

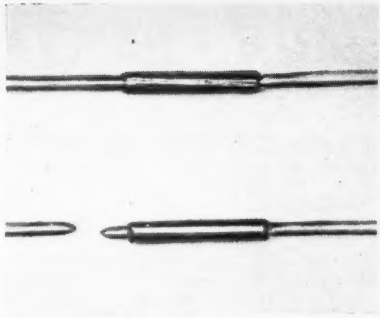
Complete wiped joints between aluminium sheathed cables and lead sleeves were not an easy subject for quantitative tests, the lead sleeve being invariably the weakest link. However, such joints, under positive pressure, have been subjected to over ten million cycles in a specially designed vibration tester without any signs of failure. By using copper and aluminium sleeves high internal pressures (up to 200 lb/sq in) have been applied to the joints, and these tests have shown them to be quite capable of withstanding the stresses likely to be encountered in service.

Such severe mechanical tests as those mentioned prove the firmness of the bond between solder and aluminium; prolonged storage has shown it to be free from undesirable ageing effects over the whole possible temperature range of operation from minus 10 deg C to over 100 deg C. Elimination of flux reduces the risk of corrosion and joints have withstood 200 hours' exposure in salt-spray cabinets without reduction in strength. Despite this reassuring information, it is still recognized that the joints may be susceptible to eventual corrosion in extremely wet conditions; therefore all external joints in damp situations should be protected by bitumen, or other suitable means, as a precautionary measure and as good practice.

Conductor Joints

The technique of making wiped joints on the aluminium sheath cannot be readily applied to stranded aluminium conductors because it depends for its success upon the complete removal of the oxide film by abrasion. Nevertheless a slight modification enables solid aluminium conductors of the type sometimes used in small power cable to be soldered together by methods almost identical to those employed for their copper counterparts; this method is particularly applicable to cables in which the conductors are single aluminium wires of 0·1in diameter or greater. Once the aluminium surface has been tinned with the special solder, conventional tinman's solder may be applied to it with complete satisfaction.

The procedure requires therefore that the exposed ends of aluminium wires be abraded, preferably with glass paper, and tinned by brushing; to complete the joint



Soldered joints of 0.144in diameter aluminium conductor before and after tensile strength test

it is then only necessary to slip a tinned copper ferrule over the prepared ends and to apply tinman's solder. Copper ferrules are preferred to aluminium for the very good reason that a perfectly tinned surface on the inside of an aluminium ferrule is not readily obtainable. The introduction of copper does not entail any corrosion hazard in these circumstances, since moisture is not present.

The simple and effective methods described above for tinning aluminium and producing wiped unions on the aluminium sheath have been communicated to and adopted by cable jointers all over the world. Competent workmen have no difficulty in learning and applying them, following a single demonstration of the procedure, and it has become fully accepted as an indispensable part of their curriculum.

Many hundreds of such joints have now been made and have given satisfactory service in a wide variety of situations, thereby fully substantiating under the rigorous test of practical conditions in the field the reliable performance originally demonstrated by laboratory investigation.

Windsor Castle to be Floodlit

WHEN the original Festival of Britain proposal to floodlight Windsor Castle had to be abandoned on the grounds of economy, the British Thomson-Houston Co., Ltd., volunteered to undertake a suitable scheme of illuminations at its own expense. This will be a contribution from the company to this year's festivities, and the scheme is to be in operation during limited periods throughout the Festival months.

PERSONAL and SOCIAL

News of Men and Women of the Industry

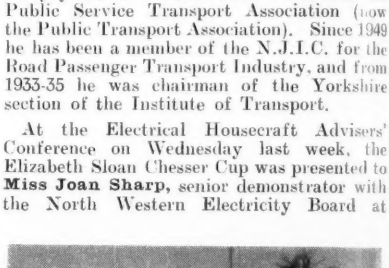
IN our issue of 2nd March we reported the election of **Mr. P. H. Spagnoletti,** B.A., M.I.E.E., A.M.I.R.E., as chairman of the British Radio Equipment Manufacturers' Association. Mr. Spagnoletti is director and general manager of Kolster-Brandes, Ltd., and manager of Brimar Valves (Standard Telephones and Cables, Ltd.). He graduated at Trinity College, Cambridge, and joined Standard Telephones & Cables in 1929, working in an engineering capacity on the high-power short-wave transmitters on the transatlantic telephone link and the ship to shore transmitters and in 1932 he was put in charge of the planning, engineering installation and testing of the first two Daventry Empire Broadcasting Stations. In 1934 he went out to the Far East to assist in the telephone circuits to be established from Shanghai to Tokio, London and New York on the engineering side and also as engineering sales representative on radio work with the China Electric Co. On returning to Europe in 1937 he travelled considerably in connection with technical sales work on civil aviation radio. During the war Mr. Spagnoletti was in charge of the aviation development work in the Radio Division of Standard Telephones & Cables, and in 1945 was appointed chief engineer of Kolster-Brandes and later general manager.

Mr. P. H. Spagnoletti

Mr. Arthur E. Hardiman, A.S.M.A., A.I.W.M., has been appointed personal assistant to the managing director of H. Fisher (Oldham), Ltd. Until recently he was divisional sales manager with Bendix Home Appliances, Ltd.

Mr. C. R. Tattam, general manager of the Bradford Corporation Passenger Transport Department, has retired after twenty years' service with the undertaking. Mr. Tattam joined the Maidstone Electricity Department in 1904 and in 1910 became power station superintendent at Chichester. He went to Llanelly in 1912 as tramways manager and engineer, and during the 1914-18 war served on the Western Front, being awarded the M.C. He was appointed engineer and manager of the Mansfield & District Tramways Co. in 1919 and in the following year became operating manager of the Balfour Beatty group of transport undertakings. He took up his appointment at Bradford in 1931. Mr. Tattam was president of the Municipal Transport Association in 1944, and served for many years on the Executive Council of the Public Service Transport Association (now the Public Transport Association). Since 1949 he has been a member of the N.J.I.C. for the Road Passenger Transport Industry, and from 1933-35 he was chairman of the Yorkshire section of the Institute of Transport.

At the Electrical Housecraft Advisers' Conference on Wednesday last week, the Elizabeth Sloan Chesser Cup was presented to **Miss Joan Sharp,** senior demonstrator with the North Western Electricity Board at Oldham, who is the winner for 1950. The cup was presented by Dame Caroline Haslett, Director of the E.A.W.



Dame Caroline Haslett presenting the Elizabeth Sloan Chesser Cup to Miss Joan Sharp. Mr. V. W. Dale, general manager and secretary of E.D.A., is on the left

The staff of the **Liverpool Electric Cable Co., Ltd.,** held their annual dinner at the Exchange Hotel on 1st March. Mr. W. J. Terry (managing director), Mr. G. E. Jewell (director) and Mr. F. W. Freeman (director of an associate company) travelled from London to attend. Mr. J. T. Frost (works manager), in welcoming the visitors, expressed

regret that Miss M. J. Waters (secretary) was unable to be present owing to illness and asked Mr. Terry to convey to her the staff's wishes for a very speedy recovery. Miss McLean presented to Mr. Terry a pair of gold cuff links, subscribed for by the staff and given as a memento of the golden jubilee of the company. Mr. Terry thanked the staff for their gift.

Alderman Eric Simms, a member of the South Eastern Electricity Board, has been nominated as the next Mayor of Brighton. The selection is appropriate in view of the fact that the British Electrical Power Convention is to be held at Brighton this year. Alderman Simms was chairman of the former Brighton Electricity Committee.

Dr. **P. Dunsheath** (director of W. T. Henley's Telegraph Works Co., Ltd.) and **Major W. F. Fraser Scott** (director of Tube Investments, Ltd.) are members of a Universities and Industry Productivity Team which sailed for the United States in the *Queen Mary* this week.

Mr. **F. G. Penny,** M.Inst.C.E., M.I.Mech.E., has been appointed managing director of International Combustion (Holdings), Ltd., and its subsidiary International Combustion, Ltd., in place of Sir George Usher who has resigned that position with both companies but remains a director.

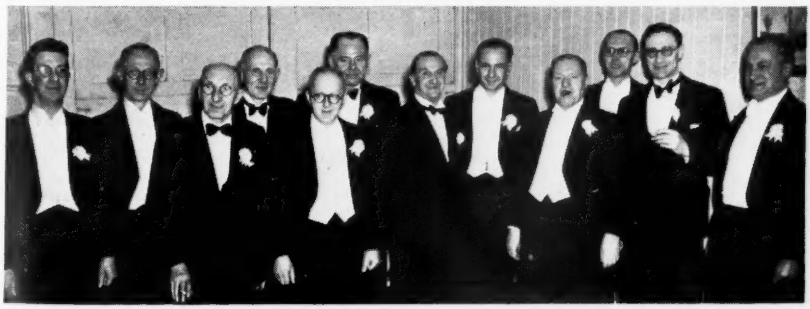
The third annual post-war ball of the Birmingham branch of the **Electrical Industries Benevolent Association** was held recently at the Tube Investments Social Club, Oldbury. About 400 members and guests attended and the chairman of the Birmingham Committee, Mr. J. W. Donovan, thanked all present for their support, which would result in a welcome contribution to the funds. He also expressed appreciation of the work of Mr. L. Wall, hon. secretary, Mr. J. M. Surrall and the members of the Social Committee in organizing the event. Midland electricity firms gave an imposing array of prizes, which were presented to the winners by the chairman's wife, Mrs. J. W. Donovan.

Mr. E. R. A. Milne, A.M.I.E.E., formerly an assistant sales engineer in the Manchester area for Newman Industries, Ltd., has been promoted to be branch manager for Scotland at their Glasgow office, in charge of electric motor sales. Before joining Newman Industries, Mr. Milne was with George Ellison, Ltd., and Everett Edgcumbe, and was also for a period with the Dundee Corporation Electricity Department. He is a member of the Institution of Mechanical Engineers and also of the American Institute of Electrical Engineers.

Mr. E. R. A. Milne

The fourth annual dinner and reunion of the **ex-Johnson & Phillips Association** was held at Grosvenor House, London, on 3rd March, nearly 100 members attending. Mr. G. L. Wates, Mr. W. Glass and Mr. R. W. C. Reeves attended from the board of Johnson & Phillips, Ltd. Mr. J. P. Elliott (Davey Paxton & Co.), proposed the toast of the Association, and Mr. A. J. Shrosbery (T. Clarke & Co., Ltd.), the chairman of the Committee, thanked him on behalf of the members. During his response, Mr. Shrosbery said that Mr. H. D. Parsons (Enfield Cables, Ltd.), had undertaken the work of hon. secretary since the formation of the Association. Unfortunately, because of great pressure of work, he had asked that

The E.I.B.A. (Birmingham) Social Committee. (Left to right): Messrs. H. C. Fox, H. Hanks, F. O. Rogers, J. W. Johnson, J. M. Surrall, G. Redmond, L. Wall (secretary), J. W. Donovan (chairman), A. H. Adey, B. Graham, J. Clements and S. J. Vaughan



another member of the Association should now carry on this work. Mr. W. F. Smith (Johnson & Phillips), agreed to do this. The remainder of the officers of the Committee were re-elected. Mr. J. Johnson Smith (Electric Construction Co.), said that Mr. P. V. Palmer and Mr. J. L. Hards had been chosen by Johnson & Phillips, Ltd., as the two best student apprentices at Charlton during 1940. Mr. G. Clifford, the employee with the longest service at Johnson & Phillips, presented a cheque to each apprentice.

Mr. Alan P. Good, managing director of the Brush-A.B.O.E. Group, has just returned from a 25,000 mile tour of the Commonwealth and the United States with orders worth about £5 million, including contracts valued at about £3 million from India and Pakistan, £¾ million from Australia and New Zealand and £½ million from Eastern countries. Further contracts worth more than £1 million were also negotiated during the tour.

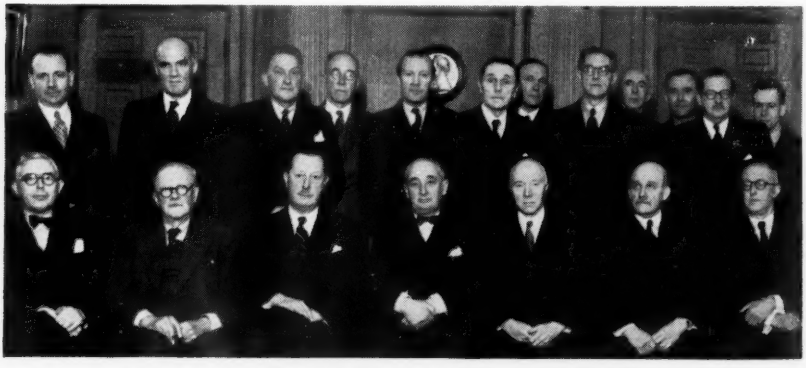
Mr. J. D. Sutcliffe has been appointed commercial director of Richard Sutcliffe, Ltd.

Last week we reported the handing over of a cheque for £71,000 which had been subscribed by members of the British Electrical & Allied Manufacturers' Association for the perpetual endowment of the Chair of Electrical Engineering at Cambridge University. We now reproduce a photograph of representatives of the University, the B.E.A.M.A., and the Institution of Electrical Engineers taken on that occasion.

Mr. G. Gould, of the Lighting Service Bureau, London, who retires this month, is known to thousands of people who have attended lectures since the Bureau first started in 1924. "Handy," as he has been affectionately known by everyone connected with the Bureau, has been there since its earliest days when Mr. W. E. Bush was manager. He was formerly with the B.T.H. Co.

Mr. Harry Leaver, who is retiring after forty-eight years with the Burnley electricity undertaking, and latterly district manager, has been presented with a vacuum cleaner by his colleagues. Before vesting day Mr. Leaver was deputy borough electrical engineer of Burnley.

The fifth annual dinner of the **Admiralty Electrical Engineers' Asscciation** was held at Fortts Restaurant, Bath, on 6th March, under the chairmanship of the President, Mr. E. W. Tucker. It was attended by 82 members and ex-members, representative of the Association's activities at all the Royal Dockyards and Regional Headquarters throughout the country. In addition, the guests included the Second Sea Lord, Vice-Admiral A. C. G. Madden, C.B., C.B.E., Mr. S. Mayne, general secretary of the Institution of Professional Civil Servants, and Mr. N. G. Holt, Assistant Director of Naval Construction. The toast of "The Association" was proposed by Mr. Mayne who drew attention to the difficulties of staff negotiations in the



Group at last week's Cambridge ceremony

Back row (*left to right*): Mr. D. Maxwell Buist (Export Director, B.E.A.M.A.), Prof. H. S. Kirkaldy (Prof. of Industrial Relations), Sir Archibald Gill (President, I.E.E.), Dr. L. B. Turner (University Reader in Engg.), the Hon. J. R. Rea (Secretary, B.E.A.M.A.), Sir Stanley Angwin (Past President, I.E.E.), Col. D. Portway (Master, St. Catharine's College), Col. B. H. Leeson (Director, B.E.A.M.A.), Mr. J. T. Spittle (formerly Lecturer in Engg.), Mr. R. H. Angus (Lecturer in Engineering), Mr. W. K. Brasher (Secretary, I.E.E.) and Dr. G. D. S. MacLellan (Demonstrator in Engg.). Front row (*left to right*): Prof. J. F. Baker (Prof. of Mech. Sciences), Sir Charles Inglis (formerly Prof. of Mech. Sciences), Sir George H. Nelson (President, B.E.A.M.A.), Mr. S. C. Roberts (Vice-Chancellor and Master of Pembroke College), Mr. G. Leslie Wates (Chairman, B.E.A.M.A.), Sir Harry Railing (Past-President, I.E.E.) and Prof. E. B. Moullin (Prof. of Electrical Engineering)

Civil Service. Mr. Tucker replied on behalf of the Association. Mr. L. G. Bolton, O.B.E., M.C., Assistant Director of Electrical Engineering, proposed the toast to the guests and particularly welcomed Vice-Admiral Madden. In reply, Admiral Madden mentioned that as an ex-torpedo officer, he had been responsible for the electrical equipment in H.M. Ships. In this connection he had never come across any work of the Department of the Director of Electrical Engineering which was not of the highest order, and he thanked the Department as a member of the Board of Admiralty.

Mr. **R. Taylor** has been appointed assistant general sales manager of Aron Electricity Meter, Ltd. Before joining the sales organization eighteen months ago Mr. Taylor was assistant to the technical manager of the company concerned with development and research on meters, instruments, etc.

Mr. **J. Stuart Robinson**, M.A.(Cantab.), has been appointed secretary of the Institute of Marine Engineers. He has been assistant secretary since 1948 and succeeds **Mr. S. C. Curling** in October.

Dr. **S. Wernick** has been awarded the gold medal of the Electrodepositors' Technical Society and it will be presented to him at the Society's annual conference at Torquay next month. The Council of the Society has conferred honorary membership upon **Dr. W. Blum**, who has been associated with the Bureau of Standards, Washington, for many years.

OBITUARY

Mr. P. C. Bullock.—The death has occurred of Mr. P. C. Bullock, A.M.I.Mech.E., A.M.I.E.E. Mr. Bullock joined the Station Design and Installation Department of the B.B.C. in 1931, having previously been with the English Electric Co., and shortly afterwards became head of the power section of the department. In 1944 ill-health compelled him to resign from this post, but he had since been responsible for the technical negotiation of all agreements for electricity supply for the B.B.C.'s stations.

Mr. J. J. Wood, of Bulpitt & Sons, Ltd., died at his home at Quinton on 6th March at the age of sixty-four. Mr. Wood joined the company in 1916 and held the position of personnel manager and advertising manager for the last thirty years. He took an enthusiastic interest in the company's social and sporting activities, and was chairman of the Sports Club.

I.E.E. Centre Dinners

North-Western

SPEAKING at the annual dinner of the North-Western Centre of the Institution of Electrical Engineers at the Midland Hotel, Manchester, on 6th March, Mr. J. Eccles, vice-president of the Institution, said that he firmly believed good engineering was at the root of industrial success. Mr. Eccles, who was responding to the toast of the Institution proposed by Mr. D. Stephenson (controller, North Region, B.B.C.) said that the I.E.E. was concerned with quality on the technical side. Unless all the great engineering, manufacturing and operational organizations coupled the technical training that was necessary to give qualifications with sound practical engineering work this country would not be able to rise to the height of its opportunities in world affairs. He understood that the roll of the I.E.E. was now 37,000, but mere numbers were not strength. Above all else the strength of the Institution was in the progressive direction of its affairs and the policy of decentralization, so that the members felt that they were participants in the Institution's activities. The future could be faced with complete confidence, especially if the I.E.E. focused attention on the quality of technical achievements.

Mr. H. G. Bell, chairman of the Centre, presided and proposed the toast of the guests, to which Mr. C. Nowell (Manchester city librarian) responded. The function was attended by nearly 350 members and guests, including the Lord Mayor of Manchester and the Mayor of Salford.

East Midland

At the annual dinner of the East Midland Centre on 9th March Major-General W. F. Hasted, new president of Loughborough College, said that there was an urgent and national need for more and higher technological education and research. There was a shocking time lag between scientific discovery and its application in industry and it was our duty to develop our technical institutions to make up the leeway lost through the ravages of war.

Sir Archibald J. Gill, president of the I.E.E., said that if Britain was to maintain her lead, the competence of her engineers must be kept up to standard.

Mr. R. C. Woods, chairman of the East Midland Centre, presided at the dinner.

PARLIAMENTARY NEWS

From Our Special Reporter

LAST week in the House of Commons Mr. Gammans asked the Minister of Transport why he refused to approve the capital expenditure necessary to complete the electrification of the line from Finsbury Park to Alexandra Palace; and what was the amount involved.

Mr. Barnes said he had not withheld approval for this scheme, the estimated cost of which was £4 million. While the British Transport Commission's total capital investment was limited, within that limitation the Commission apportioned capital investment for its Executives in accordance with its views as to priorities.

Metal Supplies

Mr. Oliver asked the Minister of Supply what steps were being taken to assist small firms to obtain a share of available metal in short supply.

Mr. George Strauss said that they had made arrangements with the suppliers to see that applications from firms who needed small quantities of metal essential to the production of engineering goods were dealt with sympathetically, subject of course to the terms of the recent Copper and Zinc (Prohibited Uses) Orders. The Ministry's Regional Offices were always available to small firms who were in difficulties owing to shortages of supplies. In cases where unavoidable scarcities of metal might force firms to reduce or cease production, the Regional Offices had instructions to assist by putting the firms into touch with larger factories and with manufacturers holding main Government contracts who were likely to require additional capacity.

Radar Defence

Mr. A. Henderson, Secretary of State for Air, in presenting the Air Estimates, spoke of the improvement in the radar chain and the detection of aircraft. He said that they had been engaged in improving the radar system, and when these improvements were completed they would have a chain of radar stations encircling the United Kingdom even more efficient than that in 1945.

Mr. Tomney, a Labour member, said that electronic equipment should be the subject of closer co-operation between the Ministry, the manufacturers and the education authorities. Its production was concentrated in the hands of a few manufacturers, and he knew of no machinery and equipment for testing, development and exploration in the Air Force or Air Force establishments and depots comparable to that in industry. Radar and submarine detection apparatus were two matters of technical importance resulting from good performance by industry which sustained our Forces during the war, but there seemed to be no link between the Ministry and industry which was concerned with the manufacture of transmitting valves, cathode-ray tubes and electronic apparatus for radar. If there were a better understanding of what was involved in the manufacture, more care would be taken in the actual use of this equipment.

Yorkshire Board Building

Attention was again drawn to the building operations at the headquarters of the Yorkshire Electricity Board, near Leeds, by Mr. Kaberry, who said that he had ascertained from the Minister of Fuel and Power that work amounting to more than £40,000 had been carried out over and above the amount licensed. Would the Minister now order an inquiry and allow the Director of Public Prosecutions to decide whether there was a case for legal action?

Mr. Robens, Parliamentary Secretary to the Ministry of Fuel and Power, said it was admitted that the authorizations were exceeded, but the breaches of the law were technical. The view of the Minister of Works was that no prosecutions should take place because misuse of materials was not involved. The Minister of Fuel and Power had been assured by the Board that it was taking action to prevent such technical breaches occurring again.

Rearmament Programme Appointments

On Monday the Minister of Supply (Mr. George R. Strauss) announced the following appointments in connection with the rearmament programme:—Director General of Machine Tools: Mr. S. W. Rawson (managing director, John Brown, Ltd.). Deputy Controller of Supplies (Aircraft) Production: Mr. W. C. Puckey (director and general works manager, Hoover, Ltd.). Deputy Controller of Supplies (Munitions) Production: Mr. A. G. E. Briggs (assistant managing director, Tube Investments, Ltd.). Chairman, Steel (Rearmament) Advisory Panel: Mr. E. W. Senior (commercial director, Iron and Steel Federation, and chairman, George Senior & Sons, Ltd.). The Minister said that he wished to express to the chairmen and boards of the companies concerned his warm appreciation of their action in placing at his disposal the assistance of these gentlemen, who would serve unpaid. He was considering further appointments in the near future. In addition he had established a panel, presided overby Mr. T. W. Senior, to deal with the allocation of steel for the rearmament programme.

Thermo-Electric Measurements

Discussion at I.E.E.

At a recent meeting of the Measurements Section of the Institution of Electrical Engineers in London a discussion on electrical measurement by thermal effects was opened by Professor J. Greig, Dr. L. G. A. Sims and Dr. J. G. Freeman.

Prof. Greig began by dealing with calorimetric measurements, which included a variety of applications to electrical problems, mainly in connection with the estimation of the electro-magnetic energy degraded into heat by ohmic, ferro-magnetic or dielectric effects. He briefly described the types of apparatus employed, indicated the special techniques involved in their use and concluded by demonstrating the difficulty of estimating the overall accuracy of such measurements.

Dr. Sims then spoke on primary constants, including the specific heat of magnetic steel stampings, and also on air-cooled calorimetry, including the measurement of small temperature rises. He showed that thermal measurements from which electrical quantities might be deduced offered advantages in certain cases and could be simpler than had been generally believed. If it was held that such thermal measurements had no very high accuracy, at least the inaccuracy would be unlikely to lead to anything more serious than a small error in the calculated number of watts.

Some theoretical considerations in connection with calorimetric measurements were then put forward by Dr. J. G. Freeman. His remarks were concerned with the calculation of electrical input to a body by measurement of its temperature and the effect on such calculation of the variation in temperature between different points of the body at any given instant.

Losses in Magnetic Materials

In the following discussion several speakers referred to the lack of information on losses in magnetic materials at inductions of about 18 or 20 kilogauss, which were common in alternator design. Several methods were suggested for segregating the heat energies developed in the copper exciting windings and iron specimens, so that calorimetric measurements could be successfully carried out at these high induction levels. For example, the calorimeter as a whole might be placed inside a large exciting winding with adequate thermal screening between the two elements.

It was pointed out that the distribution of heat generation in iron specimens might vary widely with the flux density and that this factor should be taken into account in any calculations based on the use of distributed thermocouples. Several speakers were in favour of ballistic heat methods, on the lines of bomb calorimetry, since these gave an integrated result which was independent of complicated temperature gradients and transient phenomena. Reference was made to the techniques employed by Prof. Bates of Nottingham involving the use of thermocouple current transformers and ballistic galvanometers, with which it had been possible to measure the temperature rise not only over one cycle, but even at the point in the cycle where the heat was principally developed.

Factors in Thermocouple Accuracy

It was also mentioned that, at best, a thermocouple could measure only its own temperature and that in surface temperature measurements accuracy depended not only on good thermal contact, but also on the preservation of the normal heat emissivity of the surface. The thinnest of air films produced a considerable temperature drop and emissivity was seriously reduced by some varnishes which were opaque to infra-red radiation. Thermocouple leads should be thin and, where possible, be located in an isothermal plane. In regions of steep temperature gradient the homogeneity of connecting wires might be an important factor, while spurious e.m.f.s might also arise from strains, which had, in one case, been identified as the cause of an error equivalent to 0·25 deg C.

Methods of increasing the efficiency and sensitivity of electrical thermometry were

fully discussed and mention was made of the possibilities of new materials of high thermal e.m.f. such as blue titanium oxide. Thermistors were of value in many applications apart from that of direct heat measurement, and one speaker described a new d.c. energized bridge circuit for the measurement of r.m.s. values of complex waveforms in which two indirectly-heated thermistors were used. The waveform to be measured was applied to one thermistor and the other was fed with out-of-balance current through a d.c. amplifier. A d.c. meter in the feedback amplifier circuit gave a reading proportional to the r.m.s. value of the input.

Magnetic amplifiers suitable for use with thermocouples were described and demonstrated; noise levels were of the order of 3 μV for 10 Ω, 1 μV for 100 Ω and 0·25 μV for 2,000 Ω inputs. Minimum temperature changes of the order of 0·013 deg C could be measured and the response speed was equivalent to 10 c/s; higher speeds could be obtained, but at the expense of noise level.

One speaker drew attention to the merits of chopper amplifiers in which the d.c. input was interrupted and then amplified by normal a.c. circuits. Noise levels of 0·001 μV were claimed, and under normal working conditions an output of 4 mA in 500 Ω was given for an input of 0·05 mV. Stabilities of the order of 0·005 V per day were possible and 0·02 V per day was an average figure.

The use of air-flow calorimetry for determining the losses in high-powered generators under load was mentioned and at the other end of the power scale, a differential air calorimeter was described for measuring the heat energy of ignition sparks. Information was sought on the problems of micro-calorimetry for energies of the order of one microjoule (10 ergs). This was outside the range of the discussion, but might be approached by the use of other physical methods, e.g., the meniscus-type vapour pressure thermometer with a temperature sensitivity of the order of 0·0001 deg C.

Engineering Appointments

THE customary annual statement about the activities of the Professional Engineers' Appointments Bureau (registrar: Mr. J. Muil) shows that the number enrolled during 1950 fell gradually from 541 in January to 409 at the end of the year; 87 of them were civil, 207 mechanical and 115 electrical engineers. The average number on the register was 471, compared with 462 during 1949; the total number of registrations to the end of the year was 1,947, of whom 468 were civil, 924 mechanical and 555 electrical men.

The main work of the Bureau was concerned with engineers who were in employment, the majority of those unemployed being over 45 years of age. It is noted that a large proportion of the men on the register specified minimum salaries considerably in excess of those offered by employers when notifying vacancies.

Although at present the demand for professional engineers exceeds the supply, employers could assist by avoiding any tendency to demand qualifications and experience beyond those actually necessary for their requirements. In this way, a properly assessed salary related to the responsibility of the appointment could be more easily equated to the financial requirements of the candidate.

The number of notifications of vacancies received was 1,111, of which 335 were for civil 510 for mechanical, and 266 for electrical engineers. A considerable proportion of the overseas vacancies advised were in the Middle and Far East, India and Pakistan. Some difficulty has been experienced in finding candidates who are willing to go to those countries. There is always a steady demand from registrants for employment in Canada, Australia, South Africa and Europe, but, in general, few vacancies are notified from these countries, the employer usually requiring engineers with specialized experience. The shortage of engineering specialists appears to be world-wide and may account for the lack of suitable candidates.

There still appears to be a shortage of facilities for practical training after the completion of full-time courses. It would be of great assistance to the Bureau if employers who are able to offer apprenticeships, post-graduate or other recognized training would notify particulars of their vacancies.

Generous donations have been received from employers, but the total revenue was not sufficient to meet the expenses actually incurred and it was again necessary to withdraw from the capital originally subscribed. During the year £1,047 was received in registration and appointment fees.

VIEWS on the NEWS

By REFLECTOR

LAST week I had the opportunity of seeing a new film produced by G.B. Instructional, Ltd., "How Television Works." The film showed a television programme being watched in the home and then it "transported" the audience to the actual performance in the studio. After this the chief parts of the television camera were taken apart and their purpose explained with the aid of a working model to show how the picture was turned into electrical impulses and then reinstated as a picture at the receiving end. Although intended only as a popular introduction to the subject it was extremely well done and should be of interest to a very wide audience. My first reaction is, of course, that the film ought to be televised by the B.B.C. so that all viewers would have the advantage of seeing it, but the existing gulf between the B.B.C. and the cinematograph world makes this impossible at present. I sincerely hope that the gulf may soon be bridged to save the B.B.C. from having to present such films as "Holiday in Paris."

* * *

Cuckfield Council members are said to have "gasped" when they were told at a recent meeting that they were to receive £2,020 in respect of rates from the British Transport Commission and the British Electricity Authority. The gasp was one of gratified surprise—not indignation as one would suppose nowadays—because the amount was more than double that received from the boards' predecessors. How this comes about I do not know but it is certainly unusual.

* * *

It was recently said by the chairman of the Kingston-on-Thames Highways Committee that the reduction of street lighting in the borough will save £361 and 70 or 80 tons of coal in a full year. Actually the position is that the South Eastern Board, which supplies the electricity, will lose that amount of revenue, but whether the B.E.A. which generates the power will save so much coal is questionable. It is too often assumed that the saving is in direct proportion to the reduction in electricity consumption whereas this is by no means the case. In their more candid moments Ministers admit that the main effect of banning signs and reducing street lighting is "psychological" rather than economical. But, as I have hinted before, their acquaintance with the public's psychological reactions in this matter is rather slender.

As a footnote to this, I see that the Eastbourne Council is not to extinguish street lamps half an hour earlier. The Highways Committee recommended this course after being told by a local official of the Electricity Board that the saving would be almost negligible.

* * *

It is very useful to consumers to have a record of their past use of electricity and this is best provided by the usual meter card. One cannot believe all that members of the public say in letters to the Press and so I hope that it is not true that meter cards are being abolished by any of the Boards. What makes one doubtful about a complaint in a Darlington paper that this is being done is a further remark of the correspondent that a meter reader, in imparting the information, said that he was "not supposed to tell consumers the amount consumed." The letter ends with the rather irrelevant remark:—"When are we going to get rid of this inefficient Government?"

* * *

The Glasgow *Evening News* under the heading "Vats to Watts" says:—"The old Ledaig distillery at Tobermory will again supply the wherewithal for the town to get lit up—the North of Scotland Hydro-Electric Board have taken it over for use as a new generating station." I wonder if this change from whisky to water will be generally approved.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electrical-Vector Conventions

IN his recent article Mr. Scroggie writes, "It is therefore convenient to imagine this resistance as if it were a source of back e.m.f. . . . it is not really an e.m.f. . . ." This view seems to be widely held, but I am anxious to find out if there is any reason more fundamental than common usage for thus regarding the e.m.f. of a pure resistor as unreal.

My own point of view is that less confusion would arise in circuit analysis if resistance (and every other variety of circuit element) were to be regarded as a real source, *i.e.*, as exerting a force (of either positive or negative sign) tending to cause movement of electricity in the circuit, or, in other words, as exerting a real e.m.f. Considerations in the next paragraph suggest that it is as reasonable to use the concept of e.m.f. with a resistor, as it is to use it with, for example, a voltaic cell. The e.m.f. of a resistor is a function of the current through it ($= -R \times I$), as is the e.m.f. of an inductor ($= -L\frac{dI}{dt}$). To refer to it as a back e.m.f. is unnecessary. It is not incorrect, and may be useful in particular cases when it is desired to emphasize the fact that the e.m.f. is acting against the direction of the current; but no ambiguity can arise if the "back" is omitted, since the resistor embodies no other e.m.f.

A p.d. appears between the terminals of a voltaic cell because atoms are impelled to leave an electrode and enter the electrolyte as ions, or *vice versa*. The impelling force is not an electrical force; *i.e.*, it is not caused by interaction between the ionic charge and an electric field; but it leads to a p.d. between the electrode and the electrolyte and so to an electrical force on the ions, which balances the original force. Thus the original non-electrical impelling force is an essential part of the link between energy which is not electrical (chemical energy in this case) and electrical energy. The work done by this force per unit positive charge is the e.m.f. of one part of the cell. This process has been considered in some detail in order to emphasize that the e.m.f. of the cell is the work done on unit positive charge by forces which are not electrical.

Wherever the conversion of electrical energy to another form of energy, or *vice versa*, takes place, there must be such a non-electrical force acting on the charge. In an ordinary resistor this force is frictional; it acts directly on the particles carrying the charge and hence indirectly on the charge itself. It is a real force. If it were not, there could be no conversion from electrical to heat energy. The manifestation of such a force, on passage of an electric current, is a fundamental property of the resistor. I find no good reason why the work done per unit positive charge, by this force, should not be termed the e.m.f. of the resistor. (Although the force may in fact act on a moving negative charge, it is the force which would act on the equivalent moving positive charge which is considered here, as in all other cases. This is in accordance with accepted convention.)

If the concept of e.m.f. were applied consistently to all varieties of circuit element, the voltage equilibrium which exists round any closed circuit would be expressed as $\Sigma E = 0$, which is simpler than $\Sigma E = \Sigma I \times R$, the form used by Kirchhoff (see, for example, *Wireless Engineer*, 1948, Vol. 25, p. 167). Moreover, if an arrow is placed beside a component to indicate the direction of the e.m.f. of that component, there can be no ambiguity as to the direction in which it should point. The arrow placed beside a resistor will always point in opposition to the direction taken as positive for current flow through the resistor. I gather from the correspondence in the reference which Mr. Scroggie quotes that there is no objection to this provided that the arrow is known to represent e.m.f.

The foregoing relates to e.m.f., when the choice of sign is beyond dispute, since what we mean by "positive" and "negative" charge is well established. However, ambiguity of sign does arise, as Mr. Scroggie points out, when the potential

difference between two points in a circuit is considered, unless there is some agreed convention such as the "rise" or "fall" of potential conventions which he outlines. Acceptance of the point of view that every kind of circuit element exerts a genuine e.m.f. would help to establish the rise of potential convention in our thinking which, for the reasons given by Mr. Scroggie, appears to be the more satisfactory.

Aberdeen. JAMES A. BENNET.

Peak Load and the Manufacturer

IN his letter (*Electrical Review*, 2nd March) regarding the alternative forms of control for peak load periods, Mr. Wilcox adequately summarizes the situation. It is apparent, however, that he advocates the same principle of control as that put forward by Mr. Shears in his article published in your issue of 16th February, in which the difficulties of accommodating load limiting devices (operated by lowering of voltage) to normal network voltage variations were frankly acknowledged.

I can foresee further difficulties so serious as to preclude the practicability of load shedding by any device operating on this principle. These are: that frequent visits to consumers would be necessary to adjust the device to constantly changing conditions—network changes affecting voltage, and additions to consumers' installations involving heavier connected loads, etc.; that momentous decisions on rationing of consumers would have to be made before the device could be adjusted on site to suit individual loading; that handsetting of the mechanism by consumers would cause misunderstanding and entail additional demands on the maintenance staff; that the preliminary shedding resulting from the device would cause voltage increase in the network with either "hunting" or unfair allocation to remaining consumers.

Positive centralized control, as recommended by the Clow Committee, would avoid the above-mentioned difficulties and would be applicable also, in extreme emergencies, to large blocks of dispensable load. The recommendations of this Committee were, without a doubt, based on an exhaustive study of the peak load problem, and took full account of the communal benefit which would result from the adoption of an approved centralized load control system.

It is to be hoped that with the arrival of warm weather there will be no drift to inaction in a matter of vital interest to the country.

Liverpool, 17. A. E. TRUEMAN, B.SC., A.M.I.E.E.

Historic Crompton Equipment

FOR some years we have been gathering together representative examples of the early electrical manufactures of Crompton & Co. for inclusion in a historic collection established at our Chelmsford Works. The collection is largely the outcome of years of enthusiastic searching in this country and abroad by the late Mr. J. H. Johnson. There are, however, still a number of gaps and we should welcome, and be most grateful for, information from any of your readers who could help us in our search for equipment manufactured by Crompton & Co. in the period from 1878 to about 1909.

We particularly desire to secure the following:—Crompton Barton Harris d.c. circuit breaker—1901; "Dix" gravity circuit breaker—early 1890s; "Hedgehog" transformer—about 1888; domestic electrical heating and cooking apparatus of all types—1891–1899; arc lamps, single and double carbon, open type and enclosed type, and flame arc lamp—1878 onwards; horizontal d.c. generator, 4-pole, recognizable by brushes spaced at 90 deg, type D.29, etc.—1890–1899; 2-pole smooth-core drum-wound armature, type D.104, d.c. generator or motor—1897; d.c. ceiling fan with two blades—1900; d'Arsonval "trombone" galvanometer; and pyrometer indicator and couple—early 1900s.

We are most anxious to make the collection at Chelmsford completely representative of the work of one of the pioneers in electrical engineering, and to this end we invite the co-operation and help of your readers. CROMPTON PARKINSON, LTD.

London, W.C.2. H. Fawcett, *Secretary.*

Pimlico District Heating

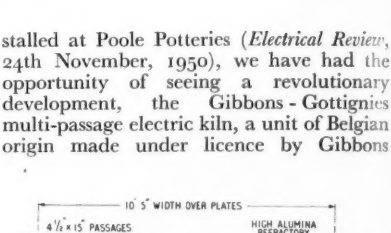
IN commenting last week on the heating of the new block of flats at Westminster by exhaust steam from auxiliary turbines in Battersea power station, we mentioned that the combined rating of the latter was only about 5 per cent of the designed capacity of the station. The figure should have been 0·5 per cent.

Pottery Kiln Developments

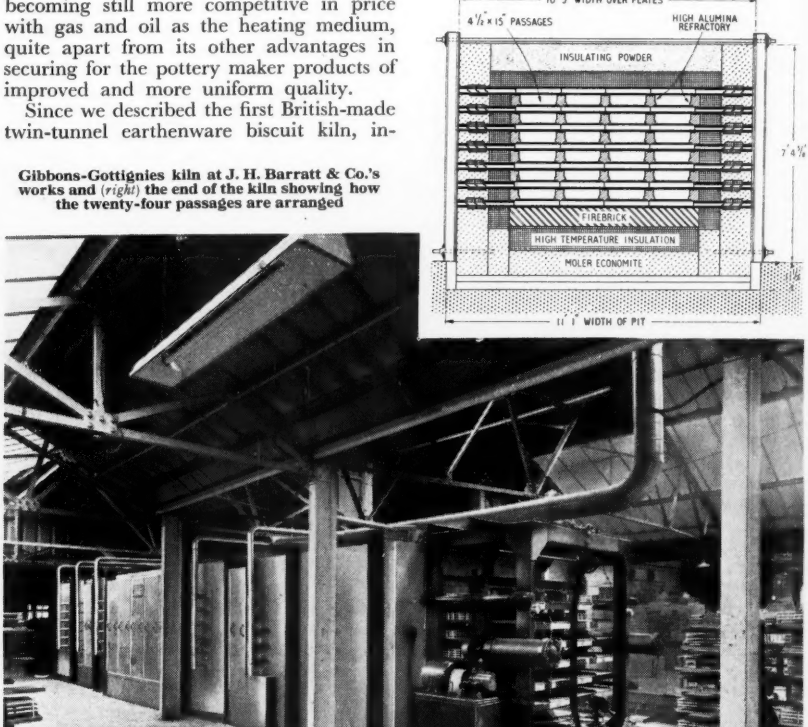
Greater Efficiency, Economy and Reliability of Electrical Methods

CONSIDERABLE activity is being shown at present by electric pottery kiln manufacturers in designing equipment which can not only be operated continuously for longer periods without attention but also is much more economical to run owing to new methods of heat conservation. As a result electricity is becoming still more competitive in price with gas and oil as the heating medium, quite apart from its other advantages in securing for the pottery maker products of improved and more uniform quality.

Since we described the first British-made twin-tunnel earthenware biscuit kiln, installed at Poole Potteries (*Electrical Review*, 24th November, 1950), we have had the opportunity of seeing a revolutionary development, the Gibbons - Gottignies multi-passage electric kiln, a unit of Belgian origin made under licence by Gibbons



Gibbons-Gottignies kiln at J. H. Barratt & Co.'s works and (*right*) the end of the kiln showing how the twenty-four passages are arranged



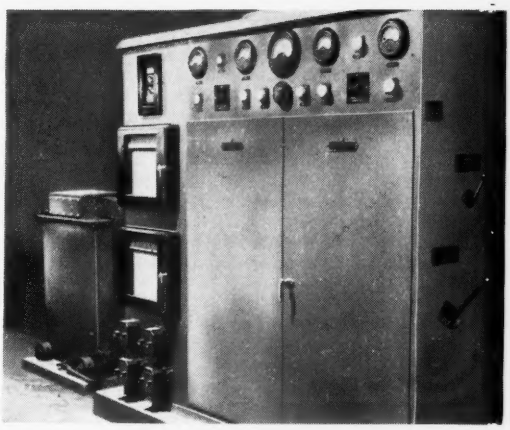
Brothers, Ltd. The special feature of this kiln is the contra-flow method of operation which makes the greatest possible use of the heat generated by having the tunnel divided up into a series of passages arranged in layers so that each adjacent passage travels in opposite directions. By this means the heat from the cooling charges is transferred to the incoming charges so taking maximum advantage of heat recuperation with consequent substantial savings in fuel.

The "Kanthal" heating elements, which are readily replaceable from the side of the kiln, are arranged horizontally, crosswise, in tunnels in the refractory slabs which form the floors and roofs of each layer of passages. An outer steel casing covers the substantial layer of insulation surrounding the passages. The setters on which the ware is carried through the passages are propelled by hydraulic gear incorporated in a fabricated steel structure which facilitates the charging and discharging of the setters.

So far three of these kilns have been installed, one for J. H. Barratt & Co. (1927), Ltd., Stoke-on-Trent, for tile glost, another for the Empire Porcelain Co., Ltd., for earthenware glost and the third for Biltons (1912), Ltd., Stoke-on-Trent, for earthenware biscuit. Another unit has been ordered by Diamond Tiles, Ltd., Hanley, to fire alternately biscuit and glost wall tiles.

Although operating temperatures vary, all the kilns are similar in general design and performance, so we propose to confine our detailed description to the glost kiln at J. H. Barratt & Co.'s Boothen Tile Works, which has been in operation longest and for which therefore more operational details are available.

In this works, where the original Dressler kiln was installed, the kiln incorporates twenty-four passages, each 15in wide by 4½in high, arranged in six layers of four passages wide. The entrances to alternate passages are coloured white and black respectively to indicate entry and exit. Setters 14⅜in by 6½in are used to hold six 6in square tiles, a covering setter being placed on top to catch any volatile waste.



The control panel with auto-transformer on the left

Crompton Parkinson motors of 2 h.p. each are used to operate the hydraulic pushing gear. Each passage has its separate ventilation system extracting at three points.

The elements are arranged in seven banks above and below the six layers of passages and are identical except that those at the top and bottom are of somewhat higher loading to compensate for the greater heat loss. The 415 V supply from the Midlands Electricity Board is kept constant at 350 V with the aid of a Gresham auto-transformer with tappings.

About two-thirds of the elements are located in the main heating zone in the centre 10ft portion of the kiln, the remaining one third being fitted in the preheating zones each side, approximately 4ft from the centre bank of elements.

Control of temperature, secured by switching on or off groups of elements, is effected by means of a Contactor Switchgear panel equipped with Kent temperature recorders (covering two zones), ammeters, relays and pilot lights. In order to get rapid response to variations in temperature in the kiln the thermocouples used are located inside the elements instead of in the actual firing passages.

To obtain the operating temperature of 1,030 deg C required for tile glost, the element temperature is set at 1,100 deg C, the time cycle being 14 hours. Although not yet tried in England, this unit has also

been fired experimentally with success at 1,300 deg C.

The plant is capable of handling 3,600 sq yd of 6in tiles a week with an average loading of 90 kW. Mr. F. W. Brammer, managing director of the company, tells us that, with an approximate ratio of furniture load to pay load of 2 to 1, this works out at approximately 21s 10½d per ton of glost ware fired—about a quarter the cost of that achieved in the producer gas installation which the new plant replaces. Although the new plant is only about one-third the length (47ft 6in compared with 150ft) it has a 50 per cent greater output and involves much less labour. The uniform heating throughout the passages makes it possible to place the tiles in any position without having to reserve different sections for different glazes. This means that it is possible to run the kiln always at full capacity. One further advantage is that with an ordinary tunnel kiln it is impossible to handle the tiles for 3–4 hours: tiles leaving the new kiln can be handled immediately. Mr. Brammer suggests the possible application of the kiln to firing floor tiles.

ELECTRICAL SIGN MAKERS

Annual Meeting and Report

AFTER the annual luncheon on 6th March, which we briefly reported last week, the Electrical Sign Manufacturers' Association held its annual meeting. Mr. G. S. Campbell (the Franco-British Electrical Co., Ltd.), vice-chairman since 1949, was elected to succeed Mr. A. E. Beadnell (Elders, Walker & Co., Ltd.) as chairman for 1951 and 1952. Mr. H. C. Vereker (Ionlite, Ltd.) was elected vice-chairman for the same period.

Tributes were paid to Mr. Beadnell for his services to the Association and a vote of thanks was passed with acclamation. In a brief reply Mr. Beadnell said that he was now more than ever convinced that the Association was a most necessary part of the electrical sign industry.

The Finance Committee reported that revenue derived from new members had largely offset increased expenditure, and accordingly it was decided to maintain the same subscription rates for 1951.

Among the matters dealt with in the annual report is the action taken by the Association to counteract the effects on the industry of the ban on electricity for advertising purposes. As a result of discussions with the Parliamentary Secretary to the Ministry of Fuel and Power, it is hoped that the ban will not only be lifted very soon but will not be repeated again in similar circumstances.

By prompt action the Association was able to have the Order prohibiting the use in many industries of copper and zinc amended while it was still in draft so as to exclude transformers, cable and other current carrying components. If this amendment had not been secured the electrical sign industry, it is said, would have been virtually closed down overnight.

The report also deals with the work of the Association in the sphere of town and country planning; its continued collaboration with the I.E.E. and the B.S.I. on technical matters; and the considerable development in the extent and use of the Association's advisory services.

HOUSECRAFT CONFERENCE

Papers on Domestic Uses

ON Wednesday last week the Annual Conference of Electrical Housecraft Advisers was opened by Mr. P. J. Noel-Baker, Minister of Fuel and Power, in the Cowdray Hall, Henrietta Place, London, W.1. Mr. V. W. Dale, general manager and secretary of E.D.A., who presided, in welcoming Mr. Noel-Baker, said that there were about 2,500,000 homes in this country where electric cookers were in regular use. Recent tests at the Building Research Station's experimental estate at Abbots Langley showed that summer electric cooking and water heating accounted for a consumption of 58 kWh a week. If 2½ million homes used electric cookers and water heaters for 100 days in the summer, they would require 145 million kWh, which was equivalent to 1,170,000 tons of coal. If these people used solid fuel for cooking and water heating for the same period they would use 1·23 cwt of coal per week, or a total of 2,150,000 tons.

Mr. Noel-Baker, in opening the Conference, said that there was an enormous potential demand for electricity. The most important fact about British industry was that it used two kWh per man hour for every six used in the United States. We must increase our industrial use. We would never be content until the working woman had in the home many of the labour-saving devices run by electricity which could save her a large part of the drudgery which day by day she now endured.

Among the speakers at the Conference were Mr. J. I. Bernard, whose subject was "Home and Commercial Laundry Equipment," and Miss M. E. Bailey, who spoke on "Modern Domestic Laundry Practice."

Mr. P. Honey gave an address on "Electrical Refrigeration," Mrs. F. R. Brown (Ministry of Health) spoke on "The Housecraft Adviser and the Hospital," and Miss Ursula Jackson gave a talk on how to plan a demonstration which would illustrate the use of a refrigerator.

Heating Pads and Blankets

Methods of Construction and Control

By H. REIK, M.Sc.(Eng.), A.M.I.E.E., A.M.I.Mech.E.*

A SURVEY recently made in twelve London districts showed that out of 778 middle class families nearly all knew or had heard of electric heating pads or blankets but only 15 per cent were using them. Objections against their use were raised by 3 per cent while the remainder were not sufficiently interested or informed as to their advantages to consider buying either a pad or blanket.

Pads and blankets sell mainly on personal recommendation whereby the satisfied user explains the performance to be expected. This article, while dealing mainly with the design of the appliance, is also intended to cover the users' views so that the reader will be able to judge and compare various types of equipment and advise on their correct application.

Pad Elements

Heating pads are usually defined as electric resistance heaters up to a size of 20in by 16in; 16in by 12in has been accepted as the general size by most manufacturers. A heating element usually consists of an asbestos core (6 or 10 ply) with a resistance wire of the nickel-chrome or copper-nickel type wound uniformly around it, being further surrounded by asbestos or glass lapping. This latter is fixed in various ways, preferably by interweaving with glass or asbestos yarns, or by attaching to some unburnable or slow burning material, so as to form a heating mat or panel.

The element is connected to some suitable connecting cord, preferably by carefully inter-twisting (solder should only be used for the ends of the twisted wires) with the joint well taped and stitched or otherwise anchored to the heating panel.

Temperature is controlled by a bimetal thermostat fitted to the heating element in such a position that it controls the greatest possible area. The thermostats are usually taped and lagged so that the user is not disturbed by them.

Waterproof heating elements have lately been introduced, consisting of asbestos or glass cored heating wire with an extruded p.v.c. covering. These elements are protected against complete wetting but it is advisable for manufacturers to ask their users to have the appliances checked every other year by their maintenance departments, as accidents might be caused by severe wetting should the p.v.c. or other waterproof covering have deteriorated after long use.

It is good practice to insert the heating panel into an inner cover of a hard wearing material. An alternative is to use a wear-resisting padding material which then serves both as padding and inner cover. The resulting assembly should then be inserted in an outer cover of a moisture-resistant material such as "Neoprene" sheet on a cotton base. It is important that the resistance of the material against maximum pad temperature should be checked by long runs. Such materials will protect against users' perspiration and normal moistening but will not stand up to complete wetting. Waterproof pads are being made where such heavy wetting is to be expected, the outer cover consisting of a waterproof material which is hermetically sealed so that no water can pass at the flex entry.

Flex Precaution

Flex should be fastened to the outer cover, thus giving a double strain relief (the first being on the heating panel). This is important, as accidents could be caused by persons lying on a pad or blanket pulling the cord and severing the connections; the strain relief should stand a pull of 35 to 50lb. Thermostats are set to a temperature of 140–170 deg F according to the manufacturer's preference and the type of pad. Three-heat pads are generally set to higher

*Isopad, Ltd.

temperatures. It is, however, good policy to design the pad in such a manner that even sticking thermostats will result in a safe final temperature under normal bed coverings.

Lagged and Unlagged Heaters

Fig. 1 shows some typical temperature curves for various wattage densities per square inch with 1in felt covering as advocated for B.S.S. tests, while Fig. 2 shows temperatures attained after 3-hour runs at various wattage densities for unlagged, 0·5in lagged and 1in lagged elements.

These graphs clearly indicate that unlagged heaters will show very temperate heat even at comparatively high loadings and that it is not advisable to ask for heating pads which can be felt to warm up very quickly as they are likely to run up to very high temperatures if the thermostat contacts stick. Scorching does not start before a pad surface temperature of 140 deg C is reached and Fig. 1 shows that it is unlikely that a pad with a surface loading of 0·2 W/sq in will reach this temperature even under thicker lagging. This should therefore be adopted as a maximum safe rating for single heat pads. Multi-heat pads should be designed for such a rating (or less) at setting 2 and should be issued with strict instructions that the highest setting (3) should not be used overnight.

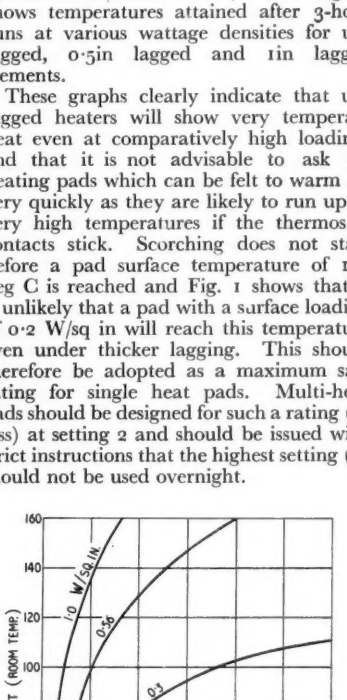


Fig. 1.—Typical temperature curves with pad surface under 1in of felt lagging

Radio interference can be caused both by the ordinary make and break action of the bimetal and by contact chatter. In the author's experience about 0·5–1 per cent of thermostats tend to have contact chatter while the interference cycle as such is more or less proportional to the wattage loading and the number of thermostats used. Low ratings and snap action thermostats will keep the interference within the prescribed limits (B.S.800). The Dubilier Condenser Co. (1925), Ltd., has made extensive tests showing that a 0·005 μF condenser across the input is usually sufficient to reduce interference to the permitted signal level while some makers of thermostats claim that their types are within the limits if correctly used.

The number of thermostats used should therefore be kept to the minimum, preferably not more than one per circuit. This will simplify construction and reduce the possibility of changes in temperature setting. If the pad has a wattage of over 0·2 W/sq in (single heat) it will be advisable to use a thermal cut-out in series with the thermostat as a safety measure, for a sticking thermostat might otherwise cause trouble (see Figs. 1 and 2). These cut-outs should be set to about 110 deg C (230 deg F) in order to avoid operation during the normal heating-up cycle of a high wattage pad when overshooting of the temperature to which the thermostat is set might occur.

Erroneous Comparisons

It is an old fallacy for the new user to compare heating pads with hot water bottles, which leads to erroneous tests and comparisons. A hot water bottle might contain about 1·5 pints of water at 200/210 deg F thus having about 200 B.Th.U., taking the difference between 205 and 95 deg F as usable temperature difference which equals about 60 Wh. These B.Th.U. are stored as a thermal mass which means that the performance will be of a high starting temperature (slightly below filling temperature) which will fall off more or less quickly according to the amount of covering used.

The heating pad on the other hand has a constant (or adjustable in the case of multi-heat pads) heat input which would without thermostats lead to fixed final temperatures determined by wattage/sq in and amount of covering as shown in Figs.

1 and 2. Thermostats are used to govern the maximum running temperatures but it is clear from Fig. 2 that uncovered pads will not reach high temperatures if they are designed with a view to safety in bed.

Conditions under actual use are slightly different as air gaps and air currents are introduced by movements of the user in bed so that the temperatures reached are often below those shown in the graphs. This has led to a clamour for quick heating up: "hot" pads using a high wattage rating. As stated above this should be avoided and the most common solution is the multi-heat pad. These employ two elements which can be connected in parallel, single and series by aid of a double-pole switch, thus giving 4 : 2 : 1 wattage ratios.

Another simple solution is the padding of one side of the appliance and using the unpadded side nearest to the body if a higher temperature is required. This design has been introduced by the author and has been employed in Isopad's "Twin-Heat" pad. It has the advantage that two heats are obtained from a single heat pad.

Electric Blankets

For blankets, the heating elements are usually of similar construction but of lower resistance per ft length than those used for pads, generally resulting in a sturdier element. While it is preferable to use a separate heating panel, some makers fit these elements simply to the outer cover by stitching them to the material.

The wattage rating is much lower than that of pads, being generally in the region of 0·07 W/sq in for single-heat blankets and less than 0·13 W/sq in for the highest setting of multi-heat blankets. This is due to the fact that high temperatures are only needed for such medical purposes as sweating cures and similar applications while blanket temperatures of 85–100 deg F prove quite satisfactory for the drying of beds and general comfort.

Strain relief should be provided in the same way as for heating pads. There is very little chance of misuse through folding and crushing as bulges under or over the sheets would cause discomfort to the user. It can happen, however, that when the bed is made the blanket may be folded several times and left on by mistake. This necessitates the incorporation of one thermostat in each circuit or at least a high

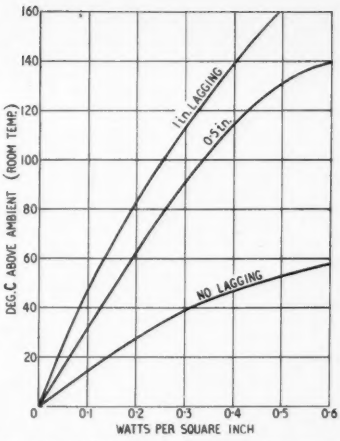


Fig. 2.—Variation of final temperature on pad surface with different wattage densities after a three-hour run

temperature fuse for low wattage blankets. Multi-heat blankets have the advantage of providing relatively quick heating-up while allowing for very low loading, usually about 0·03 W/sq in when in use overnight.

The higher price of blankets allows the use of more elaborate controls. In addition to the ordinary single-heat and three-heat blankets working on the same principles as pads there are also transformer controlled blankets, time cycle control and resistance bridge control.

Transformer controlled blankets should have a double wound and screened transformer. If run at 12 V or 24 V it is advisable to use very low loadings as blanket thermostats do not generally work at currents over 2 A even at low voltages and possible overheating by folding must be avoided.

It is good policy to use a maximum secondary voltage of 50 V and adjust the blanket loading by secondary tappings. The general disadvantage of having rather heavy transformers can be avoided by using a one-hour-rated transformer with a thermostat control on the input side which will keep the transformer temperature constant in case the user should inadvertently switch on the highest tapping (against instructions) overnight. This will then reduce the actual load on the blanket and prevent overheating as effectively as thermostats in the blanket. Transformers and blankets

must, however, be designed with this point in view.

The low temperatures employed allow also the fullest use of p.v.c. covered heating wires, making the transformer blanket ideal for hospital and nursery use.

In time cycle control the wattage of a single-heat blanket is varied by an external energy regulator. This is an "on-off" switch by which the ratio between the on and off periods can be varied to give control from 100 down to 10 per cent blanket wattage. The "Simmerstat" is a typical example but some makers prefer specific blanket designs of their own make.

The resistance bridge method of control has not so far been used in this country, but has been introduced in America. A control wire of high temperature coefficient follows the heating cord throughout the element while a bridge network of which the control wire is one arm controls the heating circuit. By setting the bridge to various predetermined resistance values the average temperature of the heating cord is controlled. Expense is the main disadvantage of this system.

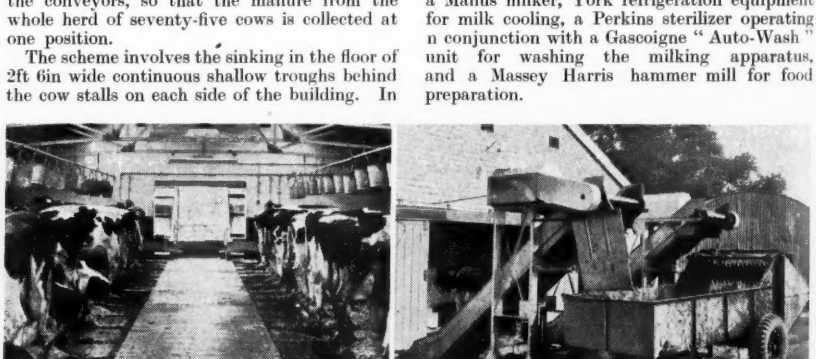
Some electric blankets can be used only for drying the bed, but others are designed for use both below and above the body and can be left on while the person is in bed. It is advisable to use mains voltage blankets on top of the sleeper during the night as the only real danger in the use of blankets is that of very severe wetting. Waterproof blankets and particularly waterproof transformer blankets can be used in all conditions. Accidents are rare and those that do occur nearly always arise from very severe misuse of the appliance. An electric blanket on a low setting and consuming only 40 W is an ideal heating arrangement. It applies the heat where it is required and allows a considerable reduction in the room temperature without discomfort to the occupant and with a saving in fuel.

Manure Conveyor

WE had an opportunity recently of seeing in operation one of the first "Darbek" manure conveyor systems to be installed. It is at Rough Hill Farm, Marleston cum Lache, Chester, where Mr. J. D. Pickering finds it of great assistance in keeping clean the shippon used for milking his herd of fifty pedigree Friesian cows. The manure from twenty-five cows in an adjacent shippon is also tipped on to the conveyors, so that the manure from the whole herd of seventy-five cows is collected at one position.

The scheme involves the sinking in the floor of 2ft 6in wide continuous shallow troughs behind the cow stalls on each side of the building. In these troughs scraper bars at 40in intervals carry the manure out of the end of the building up an incline for discharge on to the collecting area. The two units are individually driven by Higgs 2 h.p. motors with Allen West starters. The installation was carried out by the makers, the Rustproof Metal Window Co., Ltd.

Mr. Pickering also makes use of a considerable number of other electrical appliances including a Manus milker, York refrigeration equipment for milk cooling, a Perkins sterilizer operating n conjunction with a Gascoigne "Auto-Wash" unit for washing the milking apparatus, and a Massey Harris hammer mill for food preparation.



'Darbek" manure conveyor at Rough Hill Farm, Marlston cum Lache, Chester

Commerce and Industry

Electricians' Wage Increase

Highland Show Arrangements

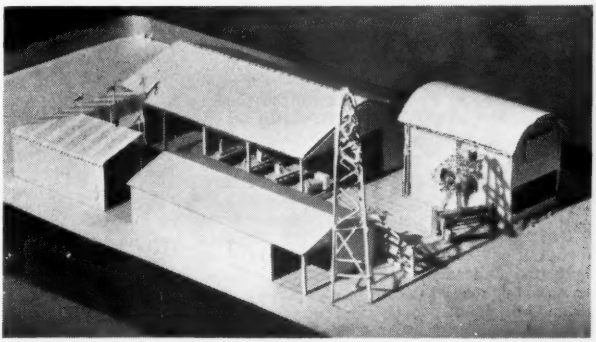
AS from 2nd April the wages of journeymen electricians in the electrical contracting industry are to be raised by 4d an hour in the London area and 3d an hour in the rest of the country. The new inclusive rates will be as follows :—Grade " A " area, 3s 8d an hour ; Mersey District, 3s 4d ; Grade " B " areas, 3s 3d. There will be corresponding increases in the rates for other classes of labour in the industry.

Signalling Equipment for Canada

The Siemens and General Electric Railway Signal Co., Ltd., has received a contract for the supply and installation of automatic signalling and interlocking equipment on the Yonge Street Subway, now under construction for the Toronto Transport Commission. The contract will be carried out in conjunction with the company's Canadian representatives, Radio Engineering Products, Ltd., of Montreal, who will be responsible for the installation under supervision of British engineers. This is the first railway signalling contract to be secured by a British firm in Canada. The value of the work is approximately 1,200,000 Canadian dollars, and is to be carried out in a period of two and a half years.

Royal Highland Show

This year the North of Scotland Hydro-Electric Board, in conjunction with the British Electrical Development Association, is staging a farm exhibit at the Royal Highland and Agricultural Society's Show, which is to be held at Hazelhead, Aberdeen, from 19th to 22nd June. The intention of the exhibit is to show electro-agricultural equipment in buildings and surroundings approximating in many cases to those in which they are normally used on the farm. Two standard agricultural buildings, together with a Dutch barn, will house the major portion of the appliances as well as the administration section. In addition, a gay splash of colour will be given to the stand by the inclusion of a colourful setting for the poultry and horticultural exhibits under canvas awnings. The dairy section, which will be housed within a standard farm building 45ft long and 18ft wide, will contain a complete working layout for a large producer-retailer dairy. In one part of the Dutch barn it is hoped to have a completely equipped electric kitchen and home laundry suitable for inclusion in most farmhouses. Water supplies will be dealt with, as also will the workshop for repairs to farm machinery. The barn machinery section will show a variety of electrically operated machines dealing mostly with milling and various other food preparation processes. Poultry keeping for the small man and the use of electricity in horticulture by the amateur gardener will be featured in another section.



Model of the electric farm to be exhibited at the Royal Highland Show, Aberdeen, by the North of Scotland Hydro-Electric Board and E.D.A.

Heating for T.S.S. " Oronsay "

Electricity is extensively used for space heating in the *Oronsay* and about 600 " Thermovent " heaters manufactured by E. K. Cole, Ltd., have been installed. In the cabins and staterooms bulkhead mounted steel cased heaters are fitted, while in the bedrooms and the suites inset type heaters are installed. In the sitting rooms a new design in a cream coloured plastic case is used fitted with a safety thermal cutout which disconnects the heater should it be

One of the 36 ton drums of cable leaving the B.I.C.C. works at Erith

8ft wide. This exceptional size has been necessitated in order that the drums can each carry a single 1,130-yd length of 33 kV, 3-core submarine power cable, the two lengths of cable to be installed by the B.I.C. Construction Company across the bed of the River Wyre between Preesall and the site of the new Fleetwood power station. This contract is being carried out for the North Western Electricity Board and the two cables have been produced in single lengths to avoid underwater joints. Each drum of cable weighs 36 tons (gross) and special transport arrangements had to be made employing two diesel lorries with 8-wheel trailers.

inadvertently knocked over or the outlet obstructed. For the public rooms, special wooden cased portable units, also fitted with safety cutouts, are available. All the heaters are fitted with double-pole switches and pilot lights. This is the sixth Orient liner to be fitted with a "Thermovent" installation.

Excessive Shop Lighting

Giving evidence in a Ministry of Fuel and Power prosecution against Max Stone, Ltd., who pleaded "Not guilty" at Exeter on 6th March to a summons alleging a breach of the regulations by excessive use of electricity at their shop, 72, High Street, Exeter, on 15th January, a Regional Inspector of the Ministry, Mr. Eric Howell, said that at 4.30 p.m. on the date in question he found 68 lamps burning. Their total wattage was 2,310, or 1,662 in excess of the legal 648 for the floor area of the shop.

In cross-examination by Mr. Bernard Caulfield, for the defence, witness agreed that he used no technical means to check the wattage and accepted the declared figures. He said he had no technical knowledge.

Mr. Caulfield contended that as the Order stated that "Nothing in this paragraph shall restrict use of electricity in any part of a shop used as a workroom," and as the shop was being so used, no offence was committed.

The magistrates, however, found the charge proved and fined the company £10, ordering it also to pay an advocate's fee of five guineas.

Large Cable Drums

On 2nd March two particularly interesting drums of cable left the Erith works of British Insulated Callender's Cables, Ltd., in Kent, for transit by road to Fleetwood, Lancs. The drums are claimed to be the largest ever constructed, each drum being 12ft in diameter and

Electric Tool Window Displays

A window dressing service has been inaugurated by Wolf Electric Tools, Ltd., for their stockists and accredited dealers throughout the United Kingdom and Northern Ireland. The displays are designed not only to suit any window size, but to make use of the individual merchants' stock of machines. The accompanying picture shows a display designed for dealers with limited window space. There are two

A display designed by Wolf Electric Tools, Ltd., which forms part of its window dressing service

others, one for stockists with adequate window space and the other, a special display of Wolf City home constructor equipment. The display backgrounds and other material are provided by the manufacturers and after an agreed period of display all the showcard and dressing material becomes the property of the merchant.

Liverpool Street-Shenfield Electrification

During the House of Commons debate on the second reading of the British Transport Commission Bill, Mr. Barnes, the Minister of Transport, referred to the electrification of the Liverpool Street–Shenfield line. He said that it was one of the most out-of-date stretches of suburban line in this country and before electrification traffic left the suburban line for the road, and all the way through to London the road carried some of the heaviest traffic and was almost impassable. But when the line was electrified the loaded coach train mileage went up by 33 per cent, passenger journeys increased by 49 per cent, and passenger receipts increased by 42 per cent. Here was an instance where the railways had won back traffic from the roads.

Industrial Art Bursaries

The Royal Society of Arts has published its report on the Industrial Art Bursaries Competition held by the Society in 1950. Awards to the value of £1,705 have been made to enable winning candidates to travel abroad. In the domestic electrical appliances section £150 was awarded to Mr. R. H. Coulthurst (L.C.C. Central School of Arts and Crafts), and a similar award was made in the electric light fittings section to Mr. A. Bednall (L.C.C. Central School of Arts and Crafts). Copies of the report can be obtained from the secretary of the Society, John Adam Street, Adelphi, London, W.C.2.

An exhibition of winning and commended designs is now in progress at the Society's House. The exhibition closes on 22nd March.

Bombay Fair Postponed

Indian Trade and Industry reports that the International Industries Fair, which was to have been held in Bombay from 1st April to 15th May, has been postponed, at the request of prospective participants, to December next.

Improvements at Euston

Work is to begin soon on a scheme of improvements at Euston station estimated to cost £300,000 and to take two years to complete. A new power operated signal box, with colour light signalling and complete track circuiting, will replace Nos. 1, 2 and 3 signal boxes. The main line working, at present controlled by No. 4 signal box, will be transferred to the new power operated box, and the existing manual block working between Euston No. 2 and Camden No. 1 boxes abolished in favour of train describers. Position light dwarf signals will control all shunting movements.

To feed the new power signalling it is proposed to obtain a power supply from a convenient London Electricity Board substation, and as an alternative source of supply it is intended to provide a standby diesel-electric set, the equipment for which is already available.

The existing platform and station yard lighting system at Euston has been in use for many years and the wiring is incapable of taking any extra load. It is therefore necessary to provide new installations with centralized controls in No. 6 platform sub-station, where the remainder of the controls are located for the proposed platform extensions and for the yard.

New Brook Barnsley Factory

Work has commenced on a 10-acre site at Barugh Green, near Barnsley, Yorkshire, in preparation for building the new factory for Brook Motors, Ltd. A winding department is envisaged for motors ranging from ¼ h.p. to 50 h.p. It is likely that the new "Z" range of control gear will also be manufactured there. The number employed at the existing Barnsley factory is over 400 and it is estimated that the new factory will absorb a further 600 people. Beyond the factory will be an up-to-date canteen to seat six hundred people and there is ample room for the provision of a sports ground alongside the factory area. It is hoped that the new building will be completed by the end of 1951.

Electrical Machinery Material Prices

The Board of Trade index number for the prices of electrical machinery materials in February was 142·0 (basis 30th June, 1949 =100). This showed a decline from the amended January figure of 143·5.

Small Motors for Argentina

Two further large contracts for electric motors for Argentina have been received by Small Electric Motors, Ltd. The value is over £20,000.

Scottish Festival Exhibition

A festival exhibition is being held by the North of Scotland Hydro-Electric Board in Dundee from 10th to 14th April. This exhibition will be the biggest of its kind ever staged in Scotland and will entirely fill the Caird and Marryat Halls and all their subsidiary rooms. It is designed to show the efficiency of electricity in all its modern applications, stressing the fuel economy aspect, and is being supported by forty manufacturers who between them will be exhibiting more than 3,000 individual

appliances. The showpiece of the Board's exhibits will be a 60ft working model of the Pitlochry hydro-electric scheme. The exhibition will be officially opened by Mrs. R. Fenton, Lady Provost of Dundee.

Catalogues and Lists

Salford Electrical Instruments, Ltd., Peel Works, Silk Street, Salford, 3, Lancs.—Technical brochure on G.E.C. quartz crystal units.

Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1-3, St. Paul's Churchyard, London, E.C.4.—Priced folder on floodlighting equipment.

Aerograph Co., Ltd., Lower Sydenham, London, S.E.26.—Illustrated instruction leaflet on the new "Aerograph" air brush (type N.S.A.).

Plastic & Metal Products, Ltd., 162, Gray's Inn Road, London, W.C.1.—Priced leaflet announcing the introduction of a range of polished metal industrial reflectors.

Tiltman Langley Laboratories, Ltd., Redhill Aerodrome, Surrey.—Technical brochure outlining the company's activities and achievements in the field of research.

Newton & Co., Ltd., 72, Wigmore Street, London, W.1.—Technical brochure describing a profile projector for gauging the dimensional accuracy of small machined parts.

Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.—Priced catalogue of floodlighting equipment.

Advertisement Correction

In the advertisement of the Hampton Works (Stampings), Ltd., in our issue of 2nd March the address was omitted. It is Twyning Road, Stirchley, Birmingham.

Trade Announcements

The South African address of **W. T. Henley's (S.A.) Telegraph Works Co., Ltd.**, is now Henley House, Corner of Fawcus & Maritzburg Streets, City & Suburban, Johannesburg, Transvaal. The Post Office Box Number is 100, Jeppe.

From 17th March the address of **Rashleigh Phipps & Co., Ltd.**, will be Thackery Street, Kensington Square, London, W.8 (telephone: Western 9621).

W. E. S. (Wolverhampton), Ltd., has removed to 84, Bilston Street, Wolverhampton. The telephone number remains unchanged.

The new telephone number of the **London Simplex/Lundberg Sales Department** is Museum 1500.

The London office of the **Electricity Trust of South Australia** is now at 7, Queen Anne's Gate, London, S.W.1 (telephone: Whitehall 3005).

Reed Crane & Hoist Co., Ltd., has moved into new factory premises at Lodge Causeway, Fishponds, Bristol (telephone: Fishponds 55631, Bristol).

London Electricians' Strike

IN a statement upon the strike of electricians in its employment the London Electricity Board says that acting in accordance with procedure agreed with the trade unions, it advertised a post for an electrician's mate at Bethnal Green. After the applicants had been interviewed one of them was appointed and he happened to be a member of the Transport and General Workers' Union. The Electrical Trades Union then claimed that he should become a member of that Union. The T. & G.W.U. would not agree to the transfer because it is one of the five unions which are a part of the negotiating machinery within the electricity supply industry.

The Board felt that it could not interfere with the freedom of its employees to belong to any of the five unions and it refused to apply compulsion to the newly-appointed mate. It accordingly instructed an electrician at Bethnal Green to work with the mate. The electrician refused to do so and he was suspended for failing to carry out instructions. Thereupon 17 men at Bethnal Green, all members of the E.T.U., withdrew their labour and 1,141 men from other parts of London later took similar action.

The Board points out that machinery exists for settling disputes between trade unions and it regrets the inconvenience caused to a few members of the public by a strike which could easily have been avoided.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"SJ.317" rotary convertors (1944).

"Lutine" sealing compounds.

"Bentall" electric grinding mills.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Ideal Home Exhibition

Comprehensive Display of Electrical Appliances

THE best opportunity of the year for the public to see the latest domestic developments is undoubtedly nowadays provided by the *Daily Mail* Ideal Home Exhibition which until the end of this month is being held at Olympia, London. Apart from the comprehensiveness of the displays an especially attractive feature is the fact that many of the appliances can be seen, often in actual operation, in their appropriate surroundings.

Among a village of model homes particular importance is attached to a house which embodies the ideas of 400,000 members of the National Federation of Women's Institutes. It is practically all-electric and among the equipment installed are a Jackson cooker, a " Creda " kettle, one of the new Ferranti " Safera " fires, a " Versco " wash boiler, a Thor washing machine, a Hotpoint drying cabinet and iron, an Electrolux refrigerator and a Decca radio set. Special attention has been paid to the lighting with a swivelling spotlight over the cooker and individual lights at strategic points in the kitchen instead of the usual centre unit. Protected power switches are another notable feature.

Another exhibit of special electrical interest was the *Daily Mail* ideal kitchen, which though in the American tradition is equipped with British equipment throughout. The U-shaped working area contains a Moffat cooker, a " Prestcold " refrigerator and a Bendix washing machine as well as many other smaller electrical appliances.

The British Electrical Development Association's contribution to the exhibition this year takes the form of a series of tableaux tracing the development of the domestic uses of electricity during the past century. Visitors are shown a house in which the rooms, though serviced electrically, are styled to period from the entrance hall of 1851, the drawing room of 1876, the Edwardian kitchen of 1901 and the bedroom of 1926 to the present-day kitchen-dining room. The introduction of " deliberate mistakes " adds to the interest.

One of the most comprehensive of the displays by individual manufacturers is that of the General Electric Co., Ltd., which with the aid of a series of special display features, covers its whole range of domestic appliances—cookers, water heaters, kettles, irons, toasters, fires, clocks, vacuum cleaners, refrigerators, radio and television recivers, lighting fittings, etc. A new item is a 2 kW nursery fire with a special guard and a wide base to give stability.

Refrigerators, cookers with high speed boiling plates, washing machines, food

E.D.A. tableaux tracing the development of electricity: a Victorian drawing room and (*right*) an Edwardian kitchen

The new Thor "Automagic" washing machine; a special G.E.C. feature introducing the "Nursery" fire; and the Frigidaire 7.4 cu ft refrigerator

mixers (now available with mincing attachments), reflector fires and plate warmers of modern design are prominently displayed on the English Electric Co.'s stand, while Belling & Co., Ltd., include in their display the new "Homeguard" 2 kW fire which is automatically switched off if it is lifted or overturned, the new "Hotspur" fire available with a special close mesh guard, the "Adam" period fire, a 2¼ kW version of the "Champion" air circulator, a cooker with wheels for easy moving, a small food warming cabinet and clothes drying cabinets.

The new "Hawkins-Universal" lightweight heat controlled iron, the "Boilette" for boiling small quantities of water and a footwarmer are among items shown by L. G. Hawkins & Co., Ltd. The "Solectra" hotplate, which is only 2in high, is accompanied on the Bratt Colbran stand by several new "Solectra" radiators. The latest cookers displayed by Elexcel, Ltd., have new streamlined handles and black switches instead of white. A bathroom fire is another recent "Xcel" development. With the latest addition to the range of H.M.V. appliances, a warming plate, are hair dryers and travelling irons in presentation cases.

A new Wilkins & Mitchell "Servis" washing machine for export

The Domestic Labour Saving Section in the gallery is almost monopolized by washing machines and vacuum cleaners. Accompanying the "Stowaway" washer for confined spaces, the 1951 model Thor "Automagic" combined clothes and dish washer incorporates several improvements including provision for saving the soapy water for re-use, while special features of the new Bendix machine are its thermostatic control, "Dyna-surge" tumble cylinder and "water rationer." The three new "Swirlux" machines (Universal Boilers & Engineering Co., Ltd.) incorporate an improved agitator and the "Laundromatic" device for automatically controlling the washing time for different loads. Besides the round "Servis" washers Wilkins & Mitchell introduce an attractive cabinet model (at present for export only) with an especially large door giving access to the wringer storage compartment: it is available with heating elements incorporated if desired. H. Fisher (Oldham),

Ltd., concentrate attention on their new "Junior" machine, and the now well-known Hoover and "Goblin" washing machines are also strongly represented.

A cabinet version of the "Oprim" rotary ironing machine with a longer roller is now available from the Aircraft & General Engineering Co., Ltd. It is foot operated and provision is made for controlling the heat and also for using only half the roller if desired. It is mounted on castors. A clothes dryer and airer is a new product of J. & H. Walter, Ltd., makers of the "No-cord" ironing board. The "Flexaway" flex carrier for an ironing board is demonstrated by J. & P. Bruce, Ltd.

Combined vacuum cleaners and floor polishers are shown by both the Henray Electrical Co., Ltd. ("Com-Bo"), and Fillerys (Gt. Britain), Ltd., while the Columbus "Mechanical Charwoman" not only acts as a cleaner and polisher but as a floor scrubber and dryer. Further examples of simple floor polishers are to be seen on the Tellus, Electrix and Vactric stands, the latter also including its "Multipol" combined polisher, food mixer and general purpose tool. The Electrix "Handyman" unit is suitable for all sanding, polishing and drilling operations while another multi-purpose machine shown by the Overseas Engineering Co., Ltd., can be used for grinding, drilling, buffing, spraying and the inflation of tyres.

A new "Goblin" cylindrical cleaner,

Cabinet type "Oprim" rotary ironer

model 59, with switch in the handle, is exhibited by the British Vacuum Cleaner & Engineering Co., Ltd. Hoover, Ltd., includes in its display the new "Junior" model. Other types of machines are to be seen on the Electrolux, Tellus, National Utilities and Water Softener & Vacuum Cleaner Service stands.

A new 7·4 cu ft refrigerator with frozen food compartment is the main feature of the Frigidaire display. Besides its domestic range, the Pressed Steel Co., Ltd., includes examples of its commercial equipment. The absorption type of machine is presented by Electrolux, Ltd.

Kenwood Electrics, Ltd., and John Perry & Co. (Plastics), Ltd., demonstrate their mixing machines and a most

A corner of the English Electric display and a part of the Belling exhibit showing on the right the new "Homeguard" and "Hotspur" fires

comprehensive display of electrical appliances of various makes has been collected on Whizards' stand. A large rubber elephant asleep in bed draws attention to the merits of the electric blankets of Windak, Ltd., who also show electrically heated gloves and foot muffs. A good selection of lighting fittings is to be found among the exhibits of Gleco Fittings, Ltd., British Electric Lamps, Ltd., and Lustro Distributors, Ltd. The " Burolite " is a new product of the British Vacuum Cleaner & Engineering Co., Ltd.

Projection television sets, with special models for low voltage operation from country house plants are demonstrated by Valradio, Ltd. Conventional models are to be seen on the H.M.V., G.E.C. and Imhof stands.

Hair dryers, massagers, infra-red and radiant heat appliances, nursery lamps, etc., are among Pifco exhibits, and dry shavers are shown by Remington Rand, Ltd., and John A. Fransen, Ltd. (" Rabaldo ").

Chance Bros., Ltd., supplied nearly a million sq ft of glass for the Crystal Palace which housed the 1851 Exhibition and the company's stand, which forms the centrepiece in the main body of the Grand Hall at Olympia, takes the form of a model of the Crystal Palace. In it is a rotating electric lighthouse optic and pedestal.

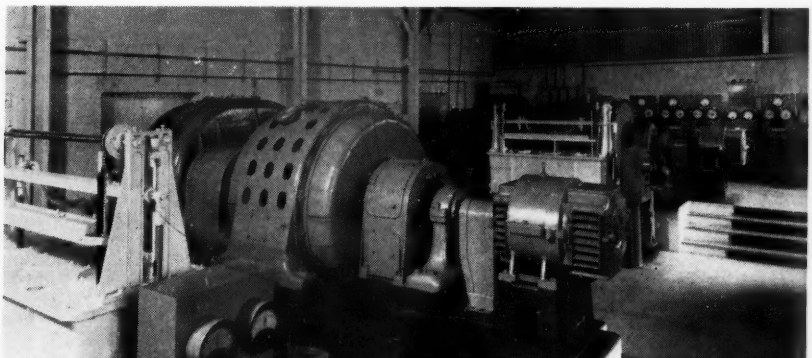
Manufacturers' Activities—X

One-third of Crompton Parkinson Products Go Overseas

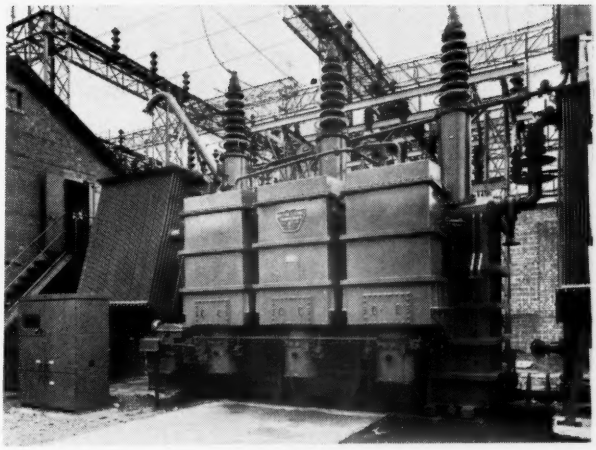
LAST year the home factories of Crompton Parkinson, Ltd., exported about 20 per cent of their products. Although there is no means of gauging the volume of smaller machines sent overseas as part of larger plant, the company believes that upward of one-third of all it makes is eventually exported; one of its works recently achieved a record of over 60 per cent. The company is interested in 16 overseas factories and has technical and production responsibilities in six of them.

A new range of totally enclosed motors is interchangeable with types conforming to American and Canadian standards; for each frame size there are two distinct designs of windings and rotor so that alternative ratings are available for the American and British markets.

The range of " Magnicon " alternators now being manufactured at the Chelmsford works under an exclusive licence from the Macfarlane Engineering Co., Ltd., Glasgow, is inherently self-regulating within $\pm 2\frac{1}{2}$ per cent of normal voltage and can, if desired, be designed for ± 1 per cent.



Part of an installation of 1,000 h.p. autosynchronous motors driving cement mixing kilns



Typical 60 MVA 132/33 kV transformer with type-LS on-load tap changing gear for push-button operation from a distance for the B.E.A.

Type "CLA" switchgear of 250 MVA, 600 A normal, at up to 11 kV, is generally similar to the metal-clad type "ALA," except that the busbar chamber is compound filled and the c.t. chamber may be either filled with heavy oil or compound, instead of being air insulated. For use with these types of gear there is the "ASA" unit for controlling a ring main or feeder when the equivalent of a non-automatic oil switch is required. The "ARA" unit is similar, but differs from the single "ASA" type by having two sets of three-phase isolators and earthing contacts for incoming and outgoing ring main control. The rating in both cases is 400 A at 11 kV, three-phase, with ability to close against a fault capacity of up to 250 MVA at 6·6 kV, or a peak symmetric short circuit not exceeding 21·8 kA.

Metalclad switchgear was supplied during the year for the North of Scotland Hydro-Electric Board; for the Sheffield University extension; and a duplicate busbar installation with remote control switchboard for the British Electricity Authority. For the reorganization of the generation and distribution systems of the British Sugar Corporation plant at Bury St. Edmunds, all the switchgear was supplied and the scheme was carried out by the contract department; twelve complete switchboards were made for the Steel Co. of Wales new plant at Margam and Abbey.

For the Toronto Transport Commission motors were designed and constructed to be mechanically and electrically interchangeable with the American type fitted to the P.C.C. tramcars.

Traction motors and control equipment were supplied for the new trolley-buses of the Nottingham and Rotherham Corporations, and traction motors for the new 8ft wide trolley-buses at Bournemouth.

"Vambac" control equipment, traction motors and resilient wheels were supplied to the manufacturers of new tramcars for Blackpool.

A prototype diesel-electric shunter with a 12-cylinder Paxman engine developing 430 h.p. was put into service at a steel works.

To cater for the increasing demand for rubber insulated cable the works at Derby has been extended and new machinery installed, designed in particular to increase output of large multicore and armoured types. Cables with conducting rubber instead of the usual copper wire screens were among the many types supplied to the National Coal Board.

Among the large orders was one for 63 miles of rubber insulated ship-wiring cable (value £30,000) and an order for high voltage paper insulated cable (value £36,000), both for Yugoslavia. Substantial orders were received from the Admiralty, Ministry of Supply, Post Office, British Railways, shipbuilders and contractors, while an outstanding contract was for the supply and laying of both high and medium voltage cable for the Trostre plant of the Steel Co. of Wales.

Production facilities at the Doncaster works have been considerably expanded and new designs of lighting fittings for industrial and commercial applications

have been developed, including a new conception of a fluorescent fitting for use in dusty, wet, or chemical-laden atmospheres, particularly designed for Indian textile mills. Commercial fittings have been used for lighting the American Embassy, Bank of England, large stores and offices.

During the year the company re-entered street lighting engineering and new Crompton equipment has been installed in Dundee, Edinburgh, Glasgow, Stockport, Durham and Birmingham areas. A programme of provincial showroom modernization has been practically completed and a mobile showroom has been fitted out for touring the country. The range of Crompton lamps has been considerably extended.

For Young commercial batteries resin-bonded glass silk sheet is now being used in the construction of the porous envelope that is used in the positive plate assembly to provide an " armour " that holds the paste firmly under conditions of severe vibration and heavy discharge. This new material replaces the " Porbonite " sheet used previously and has the advantages of greater porosity and lower internal resistance.

Nelson stud welding was used in the construction of buildings at the South Bank site of the Festival of Britain, the heat storage accumulator of the Pimlico district heating scheme, in the construction of new ships and several new power stations.

Maximum output of transformers was maintained at the works of the British Electric Transformer Co. (in association) which supplied to the B.E.A. nine of 60 MVA and a number of 45 MVA, 24 MVA and 15 MVA transformers; twenty-six for the North Western Board in sizes from 200 to 750 kVA; two 20 MVA and one 15 MVA quadrature booster equipments, fitted with B.E.T. type-LS on-load control gear, were also supplied to the same Area Board. Those supplied to the Midlands Board included four 5,000 kVA, four 750 kVA and two 400 kVA for Walsall power station and two 12 MVA for substations. The company also supplied transformers for the new rolling mill at the Rogerstone works of the Northern Aluminium Co., as well as to the manufacturers of electric furnaces installed at Rogerstone.

Overseas orders included transformers and voltage regulators for New Zealand, India, Nigeria and Southern Rhodesia and six 5·5 MVA 11/110 kV single-phase transformers for the New Zealand Hydro-Electric Commission.

Lighting of Buildings

THE lighting of buildings, naturally and artificially, was the subject of a paper presented by Messrs. W. A. Allen and R. G. Hopkinson (Building Research Station) at a joint meeting in London this week of the Architectural Science Board of the R.I.B.A. and the Illuminating Engineering Society.

Recent studies had tended to be concerned with the whole environment rather than the plane of a visual task alone. Progress had been made architecturally by trials to reduce harsh environmental contrasts without recourse to " flat " lighting, which was uninspiring. The paper showed how various approaches to the problem had influenced window design and town planning for natural lighting as well as the design of fittings and their positioning for artificial lighting.

Architectural and experimental approaches had led to identical conclusions about " good lighting," by which term the authors meant the most effective compromise, depending upon the purpose of the illumination and nature of the building. One must bear in mind that : (*a*) for maximum acuity the work should be the brightest part of the field of view with surroundings only a little less bright ; (*b*) for maximum comfort the work should be bright with the immediate surround grading off into the general lower brightness surroundings, there being a limit to the maximum task brightness, which might be of the order of 1–500ft-lamberts ; (*c*) for maximum concentration the centre of interest should be bright and colourful with dark surroundings ; (*d*) for maximal overall brilliance there should be brilliant sources of light suitably placed in the field of view, of low intensity (but high brightness) to avoid glare discomfort ; otherwise they should be graded into the background.

Totally indirect lighting of flat surfaces tended to be drab and soporific. Interest was aroused by variety of pattern ; for that reason there was advantage in ability to view the fittings and, again, for these to be of non-uniform brightness. Contrast grading in their design would avoid glare discomfort.

ELECTRICITY SUPPLY

Minister Visits Battersea

Further Tariff Revisions

THE Minister of Fuel and Power, Mr. Philip Noel-Baker, visited Battersea power station on Wednesday last week his purpose being, as he said, to thank the men, who, by their arduous labour, in the power stations, on the coasters, and on the railways, had brought in the extra coal by which the full service of electricity had been maintained. Mr. Noel-Baker said that we started the winter in November with less coal in stock at the power stations than in earlier years. Then we had the coldest December for 60 years, and that brought out a demand for electricity far greater than anybody had foreseen. In spite of power cuts, 20 per cent more electricity was sent out in each of two weeks than in the corresponding weeks of 1949. In the first week of this year, it rose to 23 per cent. In consequence, power station coal stocks fell in those weeks by nearly ¼ million tons per week; many stations were near the danger point. He had, therefore, asked that priority should be given to power station supplies. The N.C.B., the railways and others co-operated in an astoundingly successful operation. The electricity sent out had still been about 12 per cent above the amount a year ago, but since 20th January power stations' stocks had been held steady at 3·2 weeks' supply.

Mr. H. J. Bennett, chief generation engineer (operation) of the London Division of the B.E.A., and Mr. W. Wilde, generation engineer (operation) of Group II headquarters of the Division, were at the power station to meet the Minister.

Standard Tariffs in South West

The South Western Electricity Board proposes this summer to introduce a standard tariff for all domestic consumers in the Area. At a meeting in Exeter last Friday the South Western Consultative Council heard from the chairman of the Board, Mr. S. F. Steward, that the increases in the price of coal and bulk supplies, as well as other rising costs, would involve the Board in an additional expenditure of £280,000 a year.

The Board and the Council have agreed that, rather than make another interim adjustment in domestic charges, consumers would be better served if the date of standardization were brought forward, and these increases were merged into the new prices. At present, ordinary consumers are catered for by 137 different tariffs, and pay widely differing rates for their electricity. The new tariff will be of a block type and it is expected that details will be announced in July.

The Council also decided to support the Board's proposals for standard tariffs available to all industrial and commercial consumers with loads over 20 kVA. Although little change has been made in these tariffs since before the war, there will only be a small average increase to meet higher costs because the coal clause has covered the rising cost of fuel. The new charges will be on conventional two-part tariff lines, and have been framed to give advantageous terms for off-peak consumption such as night loads, and greater use of electricity in summer.

Higher North Western Charges

The North Western Electricity Board has announced that after 31st March the running charge of its two-part domestic, commercial and farm tariffs is to be raised to ¾d/kWh where they are below that figure. The flat rate for lighting will be increased to 5d/kWh and the prepaid lighting tariff to 6d/kWh. At the same time discounts and surcharges will be abolished and agreements with industrial undertakings reviewed.

Supply to Lighthouse

Romney Marsh Rural District Council has been informed by the South Eastern Electricity Board that a supply of electricity will probably be available to Dungeness Lighthouse before the summer of next year. The present 167,000 candle-power light uses vaporized paraffin.

Ulster Board's Borrowing Powers

The main reason for the Electricity Supply (Amendment) Bill which recently received its second reading in the Northern Ireland House of Commons is to extend the borrowing powers of the Electricity Board to £10,000,000. The Minister of Home Affairs (Mr. Maginess) explained that during 1950 rural electrification had been pressed forward and capital expenditure on this work amounted to £591,000, compared with the estimated £350,000. Against 148 miles of high-voltage lines constructed in 1949, last year 220 miles were erected. New

consumers connected in 1950 numbered 7,800, of whom over 4,000 were in the rural area. The number of farms served increased by 595 to 3,474. An additional capital expenditure of £1,700,000 would give supplies of electricity to another 10,000 rural dwellings, including 3,712 farms, which had been sanctioned by the Board. The rate of progress, however, would depend entirely on the availability of materials, which might be affected by the rearmament programme.

Tramway Abandonment

The Gateshead and District Omnibus Co., Ltd., in conjunction with Newcastle City Transport Department, expects soon to complete the change-over from trams to buses in Gateshead and Newcastle. Buses have now replaced trams on the routes from Newcastle Central Station to Saltwell Park and Bensham, the Low Fell (Gateshead) route will be converted on 1st April and the Dunston trams, the last, will be changed over soon afterwards.

Scottish Schemes

A White Paper published last week gives details of a Constructional Scheme (No. 56) promoted by the North of Scotland Hydro-Electric Board and approved by the Secretary of State for Scotland, which provides for the construction of a 6,000 kW diesel generating station at Stornoway to meet the growing demand for electricity there and throughout the Island of Lewis. The estimated cost is £336,000. There were no objections to the scheme.

With regard to the Shin Scheme referred to in our last issue, the North of Scotland Hydro-Electric Board informs us that the capacities of the Tirry, Cassley and Fiag subsidiary power stations should have been given as 3,500, 7,500 and 2,000 kW respectively (not 1,750, 3,750 and 1,000 kW as in the Board's original announcement).

H.V. Line Over Estate

Gateshead Town Council is in conflict with the British Electricity Authority regarding a 66 kV line which runs diagonally across the proposed Leam Head housing estate. The Council contends that if the line is left in its present position it will mean that 140 houses will have to be eliminated from the scheme. The Council also contends that the installation is unsightly, and has proposed that the line be diverted or placed underground. Both proposals have been rejected by the B.E.A. on the grounds of cost. The Authority does not support the view that the line is unsightly or that it will mean eliminating 140 houses from the housing scheme. The Council has replied that it cannot agree "under any circumstances" to leave the line in its present position.

MOBILE NEWSPAPER OFFICE

A MOBILE newspaper office, which is possibly the first of its kind in this country, has recently been put into service by the *Birmingham Post and Mail*. What appears to be a luxury coach is really a strictly utilitarian vehicle carrying a Linotype machine, a photographic dark room, a Bush late news printing machine and two generators, one providing a supply for the printing machines and the other feeding the radio, teleprinters and picture telegraphs.

Interior view of the *Birmingham Post and Mail* mobile office

Apart from its merits as an important link in newspaper production which permits the printing and publishing of the latest news and the enlarging and display of photographs, the vehicle incorporates many interesting features. The body, built by Wilsdon & Co., Ltd., in co-operation with Rootes, Ltd., has been influenced by the weight of machinery to be carried, but the overall impression is one of discretion in design and of ingenuity in the use of space.

Lighting is by 18in Siemens "Sieray" fluorescent fittings, each complete with one 15 W lamp, the installation being fed by a C.A.V. rotary convertor generating 380 c/s a.c. at 90 V from a 24 V battery. This rotary convertor is mounted on rubber and enclosed in a sound-proof container which entirely eliminates vibration and hum; it weighs about 30 lb. The lighting control gear is secreted behind the roof panels and was supplied by Siemens Electric Lamps and Supplies, Ltd.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Splitter Switches

TWO-WAY splitter switches rated at 21 A, 250 V are now available from B & H (NOTTM), LTD., Popham Street Works, Nottingham, in moulded cases. A moulded spindle with precision spring mechanism is used and the standard finish is walnut, although other colours can be supplied. The list prices are:—double-pole, 14s 6d, single-pole and neutral, 13s 6d.

Hole Cutter

The range of constant feed hole cutters made by EUCO TOOLS, LTD., 44, London Road, Kingston-on-Thames, Surrey, has been extended by the addition of a tool which enables holes to be pressure cut without having access to the inside of a tank. It can be supplied complete with three "Enox" saw blade cutters for $\frac{1}{2}$, $\frac{3}{4}$, and 1in gas pipe sizes, price 65s, or for $\frac{5}{8}$, $\frac{3}{4}$, and 1in electrical conduit, price 61s.

Unusual Neon Sign

A panel type illuminated sign available from NEOGRAM, LTD., Terminal House, Victoria, London, S.W.1, incorporates tubular glass letters like the conventional neon sign but which are detachable and interchangeable at will. The letters are simple to change as they are attached to the metal panel by magnets, and protected by a splinter proof laminated glass cover plate which, when swung down to give access to the panel, automatically disconnects the main supply. The panel is 18in high and 24in wide and the letters are available in sizes 1·5in and 2·75in high. They will be supplied in a range of colours but are initially available in a shade of orange which is claimed to be equally effective by day and night. Standard models are suitable for 200–250 V a.c. mains, but special models for different voltages and frequencies, including d.c. and battery operated types, are available. The rating is low, being less than 100 W for a 50 letter message.

Vehicle Counter

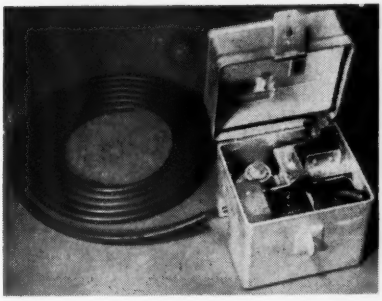
A portable vehicle computer has been developed by W. R. SYKES INTERLOCKING SIGNAL CO., LTD., in conjunction with the Road Research Laboratory of the D.S.I.R. Vehicles are counted as they pass over a tube laid across the traffic lane, their wheels causing air pulses to be transmitted to a battery operated counting mechanism, the sensitivity of which is adjustable according to the predominant nature of the traffic involved. This computer is marketed by the Westinghouse Brake and Signal Co., Ltd., 82, York Way, London, N.1.

Table Lamp Adaptor

The "Adaptalite" fitting made by PIFCO, LTD., Watling Street, Manchester, can be used to convert vases, ornaments, fancy bottles, etc., into table lamps. It comprises an ivory push-bar switch lampholder with conically shaped adjustable stopper. Three different sizes (1¼in, 1¾in and 2¼in stoppers) are supplied in an attractive carton to retail at 8s 11d each.

Battery Charger

The "Family" battery charger introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, enables 2, 4, 6, or 12 V lead-acid accumulators to be charged at home from the a.c. mains; the normal charging rate is 3 A. The charger is 9·25in wide, 5in high and 5·5in deep, and weighs 8lb 12oz. The price is £6 4s 0d.



Above: G.E.C. "Family" battery charger
Below: Sykes vehicle computer

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Taylor Tunnicliff (Electrical Industries), Ltd., reports a group trading profit, including investment income and other revenue, of £363,784 for 1950, as compared with £324,533 for 1949, and a net profit of £136,677 (against £123,428). It is proposed to pay an ordinary dividend for the year of 20 per cent (against 15 per cent), and to carry forward £333,472 (against £255,845 brought in). In his statement issued with the report and accounts, Col. W. J. Kent (chairman) says that the extension and reconstruction schemes referred to in his earlier statements are now proceeding towards completion, but some months must elapse before the full benefit is derived from these developments. Their factories continue to be fully employed and future prospects remain good.

Switchgear & Cowans, Ltd., report net profits for 1950 of £64,272, and after providing for taxation there is a balance of £24,847 (against £25,806). It is proposed to pay a dividend for the year of 20 per cent (unchanged), plus a bonus of 2½ per cent (nil). The balance carried forward is £47,536 (against £41,251 brought in).

Stothert & Pitt, Ltd., have declared an interim dividend of 5 per cent on larger capital. No interim was paid in the previous year but the final payment was 15 per cent, which included a bonus of 5 per cent. The interim dividend does not imply that the year's total dividend will be larger.

Franco Signs, Ltd., reports a consolidated trading profit for the year ended 30th Septemmer last of £70,434, as compared with £43,197 for the previous year, and a profit of £36,337 (against £15,988), before tax of £9,470. The ordinary dividend for the year is 5 per cent (against 3 per cent), and £56,548 is carried forward (against £37,381 brought in).

Ericsson Telephones, Ltd., reports a trading profit for 1950 of £1,188,223, as compared with £1,051,071 for the preceding year. Taxation absorbs £615,609, and £40,000 is placed to tax equalization reserve, leaving a net profit of £532,614 (against £486,918). General reserve receives £396,880. It is proposed to pay a final ordinary dividend of 12 per cent (same), plus a bonus of 5 per cent (against 3 per cent), payable on increased capital, making 22 per cent for the year (against 20 per cent). The balance carried forward is £213,551 (against £175,992 brought in).

R. B. Pullin, Ltd., report a group profit for the year ended 30th September last, after deducting all charges including taxation, of £30,156, as compared with £57,819 for the preceding year, all of which is attributable to the holding company. The dividend for the year is 15 per cent (against 10 per cent).

Brown Brothers, Ltd., report a consolidated trading profit for 1950 of £597,213, as compared with £409,911 for 1949, and a net profit of £249,780 (against £166,441). The net profit of the parent company is £195,179 (against £159,241). It is proposed to pay a final ordinary dividend of 10 per cent (against 7½ per cent) making 12½ per cent, less tax, for the year (against 10 per cent). General reserve and stock reserve each receive £50,000.

General Refractories, Ltd., reports a trading profit for 1950 of £485,753, as compared with £465,251 for the previous year, and a net profit of £190,767 (against £153,386). Reserve receives £75,000, and it is proposed to pay a dividend for the year of 15 per cent (against 12½ per cent). The balance carried forward is £87,682 (against £84,216 brought in).

Falk, Stadelmann & Co., Ltd.—At the extraordinary general meeting held on 5th March, the resolution increasing the company's capital by the creation of 150,000 ordinary shares of £1 each was duly carried. The company has issued letters of rights to the preference shareholders in the proportion of one new share for every nine held, at the price of 25s per share and to the ordinary shareholders one new share for every ten held, at the price of 36s per share.

A. H. Hunt, Ltd.—In his statement which accompanies the report and accounts, Mr. S. H. Brewell (chairman) says that their export figures for 1950 were double the figures for 1949. In spite of an all-round increase in turnover they were unable to fully satisfy their main markets, and it became evident that further expansion was necessary in order to meet the heavy demands. Arrangements for dealing with this additional demand are well in hand and will soon be having their effect on the business.

Wm. Sanders & Co. (Wednesbury), Ltd.—Application is being made to the Committee of the Stock Exchange, Birmingham.

under the auspices of Neville Industrial Securities, Ltd., for permission to deal in and for quotation for the whole of the issued share capital of Wm. Sanders & Co. (Wednesbury), Ltd., consisting of 1,500,000 ordinary shares of 1s each. Subject to the granting of Stock Exchange permission, dealings are expected to commence in Birmingham during the week commencing 19th March.

New Companies

Telcon Telecommunications, Ltd.—Registered 2nd March. Capital £50,000 in £1 shares (25,000 "A" and 25,000 "B"). Manufacturers, importers and exporters, developers and operators of systems for the transmission and reception of intelligence or information by means of electrical signals and cables, radio links, etc. The first directors are J. P. Jeffcock, C. L. G. Fairfield and C. F. Bareford (appointed by the "A" shareholders), and J. N. Dean, J. Innes and R. C. Mildner (appointed by the "B" shareholders). Solicitors: Bircham & Co., 100, Old Broad Street, E.C. (Reference to this company was made in our last week's issue, p. 499.)

Broadmead Wireless Co. (Bath), Ltd.—Registered 1st March. Capital £1,000. Manufacturers of and dealers in electrical and mechanical apparatus and accessories and components of all kinds, etc. Directors: J. James, B. J. J. A. Turner and C. Hasell. Regd. office: 56, Southgate Street, Bath.

Broadmead Wireless Co. (Gloucester), Ltd.—Registered 1st March. Capital £1,000. Manufacturers of and dealers in electrical and mechanical apparatus and accessories and components of all kinds, etc. Directors: J. James, B. J. J. A. Turner and K. Howard. Regd. office: 63, Northgate Street, Gloucester.

Victra (U.K.), Ltd.—Registered 26th February. Capital £100. Electrical, heating, lighting and mechanical engineers and contractors, etc. Directors: H. L. Dewdney and W. L. Morgan. Regd. office: 9, Delvino Road, S.W.6.

Hartley and Meakin, Ltd.—Registered 3rd March. Capital £250. To acquire the business of radio and electrical engineers and contractors and dealers in musical goods, carried on by V. L. Meakin and A. Hartley at Sound Shop, 129, Highgate, Kendal, Westmorland. Directors: A. Hartley, Mrs. Gene H. Hartley, V. L. Meakin and Mrs. Georgina C. Meakin. Regd. office: Midland Bank Chambers, Otley, Yorks.

Filtrite, Ltd.—Registered 2nd March. Capital £25,000. Manufacturers of and dealers in urns, electric teapots, electric coffee pots, under the name of "Filtrite," and domestic kitchen equipment, electric kettles, electric or other washing machines, etc. Directors: M. Broad, "Sedgley," Oaklands Drive, Sale, Ches, G. Heilpern, 44, Broom Lane, Salford, 7, and H. M. Williams.

Increases of Capital

Walker Bros. (Electrical Engineers), Ltd.—Increased by £40,000, in 29,333 5 per cent non-cumulative preference and 10,667 unclassified shares of £1 each, beyond the registered capital of £10,000.

Birkbys, Ltd.—Increased by £210,000, in £1 shares, beyond the registered capital of £40,000. The business has been converted into a public company.

Duralife Batteries, Ltd.—Increased by £4,900, in £1 ordinary shares, beyond the registered capital of £100.

Bankruptcies

J. Barnett and **M. Barnett,** trading together in partnership as Barnett Supplies Co., at 102 and 104c, Cranbrook Road, Ilford, Essex, radio, electrical, television dealers and contractors. (Separate application of J. Barnett).—Application for discharge to be heard on 16th April at the Shire Hall, Chelmsford.

F. F. Chicken, carrying on business at 42-44, Newgate Street, Morpeth, Northumberland, radio dealer and electrical contractor.—First and final dividend of 1s $11\frac{1}{16}$d in the £, payable 21st March at the Official Receiver's office, Gibb Chambers, 54, Westgate Road, Newcastle-on-Tyne.

TRADE MARKS

APPLICATION has been made for the registration of the following trade marks. Objections may be entered within one month from 28th February:—

RHODOID. No. 679,972. Class 9. Electrical apparatus and instruments included in Class 9.—Société des Usines Chimiques Rhone-Poulenc, Paris. Address for service c/o W. Symmons & Co., Bank Chambers, 329, High Holborn, London, W.C.1.

SEASCAN (design). No. B682,885. Class 9. Marine radar apparatus for navigational purposes.—Metropolitan-Vickers Electrical Co., Ltd., St. Paul's Corner, 1-3, St. Paul's Churchyard, London, E.C.4.

PORTOGRAM. No. 688,584. Class 9. Radio receiving sets, radio-gramophones, and sound amplifiers.—Portogram Radio Electrical Industries, Ltd., Preil Works, St. Rule Street, London, S.W.8.

No. 690,542 (design). HIS MASTER'S VOICE. No. 690,557. Both Class 9. Apparatus, instruments and devices for the recording, reproduction and transmission of sound; television transmitting and receiving apparatus; and thermionic valves, electronic discharge tubes (not for lighting purposes), sound records, sound boxes for talking machines, gramophone pick-ups, gramophone needles, navigational and signalling apparatus, optical apparatus, electrical measuring apparatus, electric vacuum cleaners, dust extractors, floor polishers (domestic), flat irons and kitchen utensils included in Class 9.—The Gramophone Co., Ltd., Blyth Road, Hayes, Middx.

INFRASAFE. No. 694,542. Class 11. Electrical heating apparatus.—H. E. Scotton, "Bedruthen," Faire Road, Glenfield, Leics.

STOCKS and SHARES

WITH the Budget so close in prospect, Stock Exchange markets can hardly be expected to show any great activity. Capital is proceeding cautiously in view of the jolts and jars which it may suffer at the hand of the Chancellor of the Exchequer, who is not expected to deal lightly with any source from which he can obtain the money necessary to finance the rearmament plan. In spite of the handicaps, however, the general run of markets shows quiet firmness. The electrical equipment and manufacturing group continues to be in favour with those who look to the future, and who are content, in the meantime, to accept a modest rate of yield on their capital.

Coming Dividends

Last month's 10s rise in the price of English Electric ordinary, on the increased dividend, and the later results of A.E.I., have put a keener edge on the anticipation with which the market awaits other principal dividends and results, in respect of 1950, from the electrical engineering industry. Speculation has taken a fairly obvious hand in several instances where the scope is most apparent. Consequently, some share prices are admittedly giving certain hostages to fortune in the shape of coming board-room decisions. Calculations are complicated by the consideration that in many instances the Budget may introduce new factors between now and the date on which dividends are normally declared. As a matter of interest, the following table shows the dates on which some important final declarations were made last year, and also a comparison between the rate of profits earned and distributed at the time.

Company	Div. % Earned	1949/50 Paid	Date 1950
A.E.I.	93	15	29th April
Auto. Tel.	72	12½	1st June
B.I.C.C.	47½	6¾	12th May
Brush	66	10	2nd March
Chloride Elec. ..	62	10	28th April
Ericsson	128	20	9th March
G.E.C.	66	17½	28th July
Henley's	66	20	24th April
J. & P.	35	15	2nd May
Reyrolle	70	15	30th March
T.C. & M.	30	9	23rd March
Siemens	19	7½	27th May
Parsons	141	15	28th April

Current Yields

Low yields are the corollary of the dividend position shown in most of the above cases. On the basis of last year's dividends, and at current prices, B.I.C.C., Reyrolles and C. A. Parsons all offer less than 4 per cent at the old rates. The yield on G.E.C. and Henley's is just on that mark, and on Siemens a little above it. On Johnson & Phillips, the return works out at rather more than 4½ per cent, and Brush shares show over 6¾ per cent.

Ericsson Results

A further expansion of about 9 per cent in Ericsson Telephone net profits (after tax) is accompanied by the maintenance of the ordinary dividend at 17 per cent, and an increase in the bonus from 3 to 5 per cent. These payments, which are free of tax, apply this time to capital increased since last year by the one-for-eight free share bonus. They involve the distribution in cash of £90,500, against £75,000 previously, but still take barely one-sixth of the distributable profit. At 47s 9d the 5s ordinary shares now show a yield equivalent to 4 guineas per cent gross, from a dividend which remains among the most conservative in the industrial lists.

Price Movements

The balance of price fluctuations during the past week has swung to the lower side. Amongst the rises that have occurred are C. A. Parsons, 81s 3d, British Electric Traction deferred, 525, Oriental Telephone, 43s 9d, and E.M.I., 21s 6d. Falk Stadelmann are quoted ex rights to the new shares, the new ordinary being 5s 6d premium, the new preference 1s 1½d premium and the old shares 41s 6d. Metal Industries also are ex rights ; the new are 8s premium, and the old shares 40s. The falls on the week are mostly 3d or 6d. Tube Investments are 3/16 down at 6 3/16 ; English Electric and General Electrics went back to 60s and 86s 3d respectively. E. K. Cole, 21s 6d, and Cossor, 12s 6d, are both a trifle lower.

Newcomer

Part of the capital of Desoutter Brothers (Holdings) was publicly offered last week, and dealings were due to begin before to-day's date. Provision for estate duties is the now familiar reason for the offer, which comprised 350,000 5½ per cent preference shares at a price of 21s, and an equal number (being a quarter of the total in issue) of 5s ordinary shares at 10s 6d. Yield on the former is nearly 6¼ per cent on a dividend covered eight times by 1950 profits. A dividend of 16 per cent is forecast for the ordinary, which would produce a return of over 7½ per cent on the issue price. In the prospectus, the company is stated to be one of the leading British producers of electric and pneumatic hand drills. Both ordinary and preference issues were well over-subscribed.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

10993. Bayard, H. M., and Roquet, R. J. C.—Apparatus for pre-correcting telegraph signals to compensate for characteristic distortion in transmission over a line. 30th April, 1945. (652601.)

27964. Compagnie Générale d'Electricité.—Telephone systems with party lines. 23rd October, 1945. (652602.)

1946

22824. General Electric Co., Ltd., and Levy, M. M.—Circuits for generating electric pulses. 15th August, 1947. (652353.)

24066. Soc. d'Applications Telephoniques.—Electron optical systems. 13th August, 1946. (652354.)

30025. Combustion Control Corporation.—Flame failure control circuits using thermionic valves. 8th October, 1946. (652605.)

32263. General Electric Co., Ltd., and Levy, M. M.—Multi-channel signalling systems. 24th September, 1947. (652356.)

34506. General Electric Co., Ltd., Espley, D. C., and Levy, M. M.—Multi-channel signalling systems. 8th October, 1947. (652357.)

1947

1758. Philips Lamps, Ltd.—Cooling devices. 20th January, 1947. (652358.)

3562. General Electric Co., Ltd., and Levy, M. M.—Pulse signalling systems. 16th February, 1948. (652361.)

5139. Western Electric Co., Inc.—Electric wave generators. 21st February, 1947. (652606.)

7998. General Electric Co., Ltd., and Levy, M. M.—Multi-channel privacy signalling systems. 16th March, 1948. (652363.)

8529. Marconi's Wireless Telegraph Co., Ltd., and Jefferson, H.—Privacy equipment for telephone and other communication systems. 13th January, 1948. (652364.)

11129. Sperry Gyroscope Co., Inc.—Radio direction-finding systems. 25th April, 1947. (652365.)

11613. General Electric Co., Ltd., and Levy, M. M.—Electric pulse signalling systems. 14th April, 1948. (652366.)

17028. Kalart, Co., Inc.—Sockets for electric photoflash lamps. 27th June, 1947. (652368.)

19903. Igranic Electric Co., Ltd.—Electro-magnetic contactors. 24th July, 1947. (652372.)

20147. Cotton, H.—System of electric lighting and apparatus for use therewith. 12th October, 1948. (Cognate application 31912, 3rd December, 1947.) (652374.)

21694. Sylvania Electric Products, Inc.—Lamp sealing apparatus. 7th August, 1947. (652609.)

22271. Bush Radio, Ltd., and Neave, P. B.—Radio receiving apparatus. 13th September, 1948. (652610.)

22685. Pye, Ltd., and Jackson, D.—Television receivers. 16th August, 1948. (652377.)

25093. General Electric Co., Ltd., Farren, L. I., and Head, N. E.—Multi-channel pulse communication systems. 26th August, 1948. (652378.)

25578. Radio Industrie.—Thermionic amplifiers. 19th September, 1947. (652613.)

30192. Philips Electrical, Ltd.—Electric discharge tubes. 13th November, 1947. (Addition to 553191.) (652382.)

30824. British Thomson-Houston Co., Ltd.—Time indicators. 20th November, 1947. (652622.)

30984. British Broadcasting Corporation, Mayo, C. G., Tanner, R. H., and Wharton, W.—Electric integrator circuits. 23rd November, 1948. (652384.)

31432. Philips Electrical, Ltd.—Pulse generators. 27th November, 1947. (652623.)

31817. Igranic Electric Co., Ltd.—Electric limit switches. 2nd December, 1947. (652625.)

33973. Standard Telephones & Cables, Ltd.—Automatic switching systems. 23rd December, 1947. (652629.)

34012. General Electric Co., Ltd., and Nixon, R. D.—Cathode-ray tube picture transmitters. 22nd December, 1948. (652630.)

34105. Wayne Kerr Laboratories, Ltd., Calvert, R., Swale, R. T., and Tole, C. R.—Electrical timing devices. 23rd December, 1948. (652390.)

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186. British Thomson-Houston Co., Ltd.—Beam antenna systems. 2nd January, 1948. (652411.)

797. Marconi's Wireless Telegraph Co., Ltd., Cooper, V. J., and Smith, N. N. P.—Voltage stabilizing circuit arrangements. 14th September, 1948. (652393.)

1733. Igranic Electric Co., Ltd.—Snap action electric switches. 20th January, 1948. (652639.)

3275. General Electric Co., Ltd., Farren, L. I., Head, N. E., and Levy, M. M.—Electric pulse signalling systems. 31st January, 1949. (652396.)

5597. Guardian Electric Manufacturing Co.—Apparatus for operating electrical discharge devices. 25th February, 1948. (652426.)

5628. Radio Corporation of America.—Power recovery circuit for cathode-ray apparatus deflection system. 25th February, 1948. (652648.)

5951. Director of the Office of Technical Services, Department of Commerce.—Electrical apparatus using electro-magnetic waveguides. 27th February, 1948. (652428.)

7124. British Thomson-Houston Co., Ltd., Graham, D. H., and Tabberer, G.—Turbine type starters for internal combustion engines. 9th February, 1949. (652472.)

7262. Fruitman, S. M. (Compagnie Industrielle des Telephones).—Frequency modulated transmission system. 9th March, 1948. (Convention date not granted.) (652473.)

7882. General Electric Co., Ltd., and Levy, M. M.—Multi-channel pulse signalling systems. 1st March, 1949. (652397.)

8693. Soc. Française Radio-Electrique.—Multiplex ultra-short wave radio relay communication systems. 24th March, 1948. (652653.)

9022. A. C. Cossor, Ltd., Wynn, A. H. A., and Oxenham, J. K.—Electric filter networks. 21st February, 1949. (652398.)

12366. Radio Corporation of America.—Alarm and automatic switching systems. 5th May, 1948. (652657.)

15008. General Electric Co., Ltd., and Levy, M. M.—Multi-channel pulse signalling systems. 7th December, 1949. (652400.)

18919. Westinghouse Electric International Co.—Electron optical systems. 14th July, 1948. (652451.)

21919. General Electric Co., Ltd., and Levy, M. M.—Pulse signalling systems. 11th August, 1949. (652402.)

21984. Philips Electrical, Ltd.—Circuit arrangements for controlling the amplitude and the frequency of an electrical oscillation. 20th August, 1948. (652464.)

24967. Ferranti, Ltd., and Glover, A. J.—Moving-coil voltage regulators. 23rd September, 1949. (652558.)

25138. General Electric Co., Ltd., and Cates, J.—Circuits for electric discharge lamps. 27th September, 1949. (652500.)

26422. Lumalampan Aktiebolag.—Electrode for electric discharge tubes. 11th October, 1948. (652506.)

26477. Soc. Anon. de Telecommunications.—Spliced joints in electric cables and tubular conductors. 11th October, 1948. (652567.)

28026. General Electric Co., Ltd., and Ralph, F. E.—Testing devices for use in telephone systems. 22nd August, 1949. (652577.)

29644. General Electric Co., Ltd., James, E. G., and Lindell, A. O. E.—Crystal contact devices and methods of manufacture thereof. 8th December, 1949. (652567.)

30516. Wandelt, R. E.—Electric radiant heaters. 24th November, 1948. (652522.)

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4341. General Electric Co., Ltd., and Levy, M. N.—Circuits for electric pulses. 15th August, 1947. (Divided out of 652353.) (652408.)

NEXT WEEK'S EVENTS

Monday, 19th March

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Radio Group. "The Magnetic Tape Recorder," by Dr. G. F. Dutton.

Birmingham Electric Club. Annual general meeting. "Electric Organisms and Living Light," by J. Ashmore.

BOURNEMOUTH.—Grand Hotel, Firvale Road, 8.15 p.m. A.S.E.E. Bournemouth Branch. "Estimating," by W. H. Brooks.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Supply Group. "A Surge Counter for Transmission Lines," by E. F. Hasler.

CHESTER.—Town Hall, 6.30 p.m. I.E.E. North-Western Centre. "The Planning of an Electricity Board's Distribution System," by G. O. McLean. (Joint meeting with the Mersey and North Wales Centre and the Chester Engineering Society.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. Informal lecture on "Radio Astronomy," by Dr. A. C. B. Lovell.

St. Ermin's Hotel, S.W.1, 6.50 p.m. A.S.E.E. Central London Branch. "Atomic Energy," by J. McCartney.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Informal lecture on "The Acoustics of Studios and Auditoria," by W. Allen.

READING.—Great Western Hotel, 7 p.m. I.E.E. district meeting. "Railway Electrification in Great Britain," by C. M. Cock.

Tuesday, 20th March

BIRMINGHAM.—Central Technical College. I.E.E. South Midland Centre. Jubilee Exhibition. Visit of President for the opening ceremony. (Continued until 31st March.)

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.30 p.m. I.E.E. North Midland Utilization Group. "Electrically Interlocked Guards on Machines," by W. Fordham Cooper.

LIVERPOOL.—Mersey and N. Wales E.B. Service Centre, Whitechapel, 6 p.m. I.E.S. Liverpool Centre. "Home Lighting," by J. N. Aldington.

LONDON.—Café Royal, 6.45 for 7.30 p.m. I.E.E. Supply and Utilization Sections. Joint dinner-dance.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Modern Lighting, including American and Continental Practice," by E. B. Sawyer.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Measurements Group. "The Use of an Electrostatic Wattmeter for Magnetic-Loss Measurements," by J. K. Choudhury and A. Glynne.

NOTTINGHAM.—Gas Department's Showrooms, 6.30 p.m. I.E.E. East Midland Centre. "The Standardization of Steam Turbine Plant," by I. V. Robinson. (Joint meeting with the East Midlands Branch of the Institution of Mechanical Engineers.)

SWINDON.—Art Centre, 6.15 p.m. I.E.E. Western Centre. District meeting. "Diesel Electric Locomotives of the British Railways," by F. A. Harper.

Wednesday, 21st March

BLACKBURN.—N.W.E.B. Demonstration Theatre, Darwen Street, 7 p.m. I.E.E. North Lancashire Sub-Centre. "The Planning of an Electricity Board's Distribution System," by G. O. McLean.

FARNBOROUGH.—R.A.E. Technical College, 6.30 p.m. I.E.E. Southern Centre. "The Radar-Sonde System for the Measurement of Upper Wind and Air Data," by Dr. F. E. Jones, J. E. N. Hooper and N. L. Alder.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "Variable-Voltage Generation Applied to A.C. Power Systems," by R. L. Chantrill.

Piccadilly Hotel, 12.15 for 1 p.m. Electric Light Fittings Association. Annual luncheon.

Waterloo Bridge House, S.E.1, 5 p.m. Institution of Post Office Electrical Engineers. Informal meeting. "The 2000-Type Selector and its Problems," by J. O. Thompson and F. Haythornthwaite.

LUTON.—Chamber of Commerce, George Street West, 7.30 p.m. Luton Electrical Society. Annual general meeting followed by an open meeting.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. "The Application of Statistical Methods to Electricity Supply," by R. B. Rowson.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "The Development and Design of Electrical Control Gear for Machine Tools," by A. R. H. Thorne.

STAFFORD.—I.E.E. South Midland Students' Section. "Electrification of Textile Mills," by H. Law. (Joint meeting with the Institution of Mechanical Engineers.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia.—BRISBANE.—28th March. State Electricity Commission. Three 500 kVA transformers. (C.R.E. (I.B.) 54794/51. Ten/2196.)*

31st May. City Electric Light Co. Three 1,500 kVA transformers. (C.R.E. (I.B.) 54881/51. Ten/2201.)*

SYDNEY.—19th April. County Council. High voltage mobile testing equipment. (C.R.E. (I.B.) 54890/51. Ten/2191.)*

Bacup.—2nd April. Corporation. Street lighting equipment. (See 9th March issue.)

Belfast.—30th March. Corporation. Repairing lead-acid storage battery. (See 9th March issue.)

Egypt.—CAIRO.—26th March. Director-General, Electricity and Gas Administration. Supply and delivery of 250 and 660 V v.i.r. cables. (See 9th March issue.)

Gillingham (Kent).—28th March. Corporation. Electrical installations in 29 houses. (See 9th March issue.)

New Zealand.—WELLINGTON.—8th May. State Hydro-Electric Department. One 80-ton electric overhead travelling crane. (C.R.E. (I.B.) 54261/51. Ten/2169.)*

15th May. Suspension strings and strain insulator strings of e.h.v. insulators. (C.R.E. (I.B.) 54952/51. Ten/2192.)* Steel-cored aluminium transmission line conductor and accessories. (C.R.E. (I.B.) 54951/51. Ten/2193.)*

12th June. Supply of 15 MVA 400 V switchgear. (C.R.E. (I.B.) 54954/51. Ten/2190.)*

Uruguay. — MONTEVIDEO. — 11th April. Usinas Electricas y Telefonos del Estado. Substation equipment. (C.R.E. (I.B.) 54078/51. Ten/2171.)*

ORDERS PLACED

Chester.—Corporation Town Hall and Parliamentary Committee. Re-wiring the Town Hall (£3,844).—Lindsey Crawford, Ltd.

Dudley.—Corporation. Electrical installations in 50 houses at Woodside.—Conroy & Owen, Ltd.

Ely.—East Anglian Regional Hospital Board. Electrical installation at Tower House Hospital (£4,242).—P. H. Allin & Sons.

Glasgow. — Corporation Education Committee. Electric lighting and heating installations at Glenspean Street School (£1,426) and Tinto Road School (£1,426).—Corporation Central Electrical Workshops.

Ipswich.—East Anglian Regional Hospital Board. Electrical engineering services at the sanatorium, Ipswich (£2,212).—Mann, Egerton & Co., Ltd.

Luton.—Corporation Education Committee. Electrical installation work at Whipperley County Primary Infants' School (£2,498).—David Thomson & Sons, Ltd.

Maidstone. — Corporation. Electrically wiring 94 houses on the Shepway Estate (£2,547).—W. & R. Pellett & Sons.

York.—Corporation. Electrical work at Fulford pumping station. Tender of Cussins & Light, Ltd., of £4,210, including provision for Ellison equipment, recommended in place of previously accepted tender of B.C.S. Electrics, Ltd., in which it was found an error had occurred.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Atherton.—Six shops and five flats, Hag Fold estate, for U.D.C. (£14,298); Andertons (Bolton), Ltd., Wharf Road, Bolton.

Barnsley.—Adaptations at Eastgate as additional accommodation for Mining and Technical College; Dyson, Cawthorne & Coles, architects, 25, Regent Street.

Bedford.—Flats (72), Mile Road; borough surveyor.

Bexhill.—Houses (74), Southlands Road estate; borough surveyor.

Birmingham.—Scheme for 235 permanent shops, with living accommodation over, on estates at the Chestnuts, Shard End, Bartley Green, Lea Hall, Kents Moat, and other small estates; Alderman G. H. W. Griffith, chairman, Public Works Committee.

Border.—Houses (10), Wetheral, for R.D.C.; John Laing & Son, Carlisle.

Carlisle.—Additional laboratories at Grammar School; Cleghorn & Co., Ltd., Burgh Road.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

Cleethorpes.—Cottage flats (44), Davenport Drive; A. B. Cooper, borough surveyor, Council House.

Colchester.—Offices, Essex Street, for Inland Revenue Dept.; Hutton (Builders), Ltd., Birch, near Colchester.

Devizes.—Six shops and six flats, Brickley Lane; borough surveyor.

Eastbourne.—Infants' school, Woodgate Road; borough surveyor.

Felling-on-Tyne.—Tile making factory for Sweet, Ltd., Gateshead; E. M. Lawson, Barras Buildings, Barras Bridge, Newcastle.

Glasgow.—Extensions to Royal Technical College (£750,000); Wylie, Shanks & Wylie, architects, 120, Blythswood Street, Glasgow.

Grimsby.—Two children's homes, Nunsthorpe; borough surveyor.

Secondary modern school for girls, Chelmsford Avenue; F. A. Would, Ltd., builders, Bourne Lane, Ladysmith Road.

Heckmondwike.—Dale Lane C.P. School for West Riding C.C.; L. & W. Morrell, Ltd., Moorside Works, Low Moor, Bradford.

Hoole.—Conversion of "Erifiad," 91, Hoole Road, as county library headquarters; F. M. Parkes, county architect, Chester.

Hyde.—Houses (12), Gloucester Road and Marlborough Road; T. Norgrove & Son.

Kidderminster.—Houses (12), Birchen Coppice; Humphries & Bowdler, Larkhill, Kidderminster.

Depot buildings at Hoobrook (£8,989); Herbert Smith, Ltd., Kidderminster.

Kingston-on-Thames.—Six shops and 12 flats, Richmond Road and Tudor Drive; G. T. Crouch, Ltd., 3/5, Thames Street.

Lancaster.—New wing, Lancaster Moor Hospital; A. Robinson & Sons (Morecambe), Ltd., Westfield Works, West End Road, Morecambe.

Leylands (Derbyshire).—Cottages (73) and assembly hall, etc., for Linen and Woollen Drapers' Institution; T. P. Bennett & Son, architects, 43, Bloomsbury Square, London, W.C.1.

Lincs.—Spilsby Secondary School; John Dutton, High Street, Skegness.

Litherland.—St. Wilfred's R.C. Secondary School for Lancs E.C.; Wm. Hall & Son, Ltd., 60, Christian Street, Liverpool.

London.—WANDSWORTH.—Flats (60), West Hill (£112,800); Dawney & Carpenter, architects, 131, Victoria Street, S.W.1.

ROTHERHITHE.—Factory, Finnimore's Place; Wyatt & Co., Ltd., 67/71, Tanner Street, S.E.1.

STREATHAM.—Maisonnettes (48) and flats (64), Coventry Hall site, for Wandsworth B.C.; Basil Hughes, architect, 34, Queen Anne Street, W.1.

Malvern.—Extensions to Winter Gardens Concert Hall; C. C. Judson, U.D.C. surveyor, Council House.

Manchester.—Block of luxury flats at Rusholme, for J. L. Mather; A. J. Seal & Partners, architects, Bournemouth.

Conversion of Queen's Road, Cheetham, tramcar sheds into bus garage; city architect, Town Hall.

Newport (Mon).—Shops with 36 dwellings over, on three sites; E. A. Middle, borough surveyor, Town Hall.

North Kesteven.—Houses (50) in five parishes; J. Chadwick, R.D.C. surveyor, 31, Clasketgate, Lincoln.

Nottingham.—Houses (166), in two schemes; C. A. Pilkington, city housing architect, The Guildhall.

Plymouth.—Factory and warehouse, Maxwell Road; British Oxygen Co., Ltd., Bridgwater House, Cleveland Road, S.W.1.

Pontypool.—Factory extensions (£600,000), for British Nylon Spinners, Ltd.; Scott & Wilson, 47, Victoria Street, London, S.W.1.

Slough.—Flats (74), Priory estate, Burnham; borough surveyor, Town Hall.

Staffordshire. — Erection of Tettenhall Castlecroft C.P. School, near Wolverhampton; A. F. R. Godfrey & Co., Ltd., 10, Clifton Street, Wolverhampton.

Stalybridge.—Three blocks of flats, Stamford Park estate; Howard & Benson, architects, 88, Mosley Street, Manchester.

Swansea.—Showrooms and offices, Castle Street; Cavendish Furniture Co., Ltd., 41, Queen Street, Cardiff.

Tendring.—Conversion of army hutments, Transit Camp, Ramsey, into 36 dwellings, including the provision of all services; W. S. Laing, R.D.C. surveyor, Council Offices, Weeley, Clacton-on-Sea.

Tiverton.—Houses (40), Wilcombe Lane; H. S. W. Stone & Partners, architects, 20, The Crescent, Taunton.

Wallasey.—Factory on 25-acre site, Moreton; Cadbury Bros., Ltd., Bournville, King's Norton, Birmingham, 30.

Houses at Chepstow Avenue, for B.C.; J. H. Waring, St. Denis, Borrowdale Road, Moreton (16 houses) and C. G. Davies & Son, St. Olaf, Reedville Road, Moreton (8 houses).

West Bromwich.—Maternity unit at Hallam Hospital for Birmingham Regional Hospital Board; D. A. Goldfinch, architect, 10, Augustus Road, Birmingham.

Whittlesey.—Eighty blocks of four flats, Victory Avenue estate, between Whittlesey and Eastrea; Ruddle & Wilkinson, architects, Peterborough.

Wigan.—Twin operating theatres at Royal Albert Edward Infirmary; Thomas Dufiy, architect to the Manchester Regional Hospital Board, Sunlight House, Quay Street, Manchester, 3.

Worcester.—Stage 1 of Nunnery Farm Secondary Modern School; W. J. Simms, Son & Cooke, Ltd., Nottingham.

York.—Adaptations at Derwent Hill, Stamford Bridge, for East Riding C.C.; Needham, Thorp & White, architects, 6, High Petersgate, York.

Central omnibus station, Queen Street; city architect.

Yorkshire.—Police houses (31) and six offices on 14 sites in the West Riding; county architect, Bishopgarth, Westfield Road, Wakefield.